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ABSTRACT

This book presents teacher-created lesson plans, sequenced by grade level, that illustrate the connection between teaching specific disciplines--English language arts, foreign language, mathematics, science, and social studies--and NETS (National Educational Technology Standards) for Students performance indicators. Each lesson sequence addresses national standards for the discipline, suggests related resources, and provides a brief narrative by a teacher who has actually used the lesson in a classroom. Several multidisciplinary learning activities are also described. Direct links are made between content standards from two or more subject areas and the NETS for Students performance indicators. Units for each grade range provide developmentally appropriate themes, tools, and resources from which teachers can choose when developing specific learning experiences for their classrooms. The appendices include the full text of the NETS for Students, a NETS workshop staging guide, a directory of NETS project partners, a list of resources, and a glossary. (MES)

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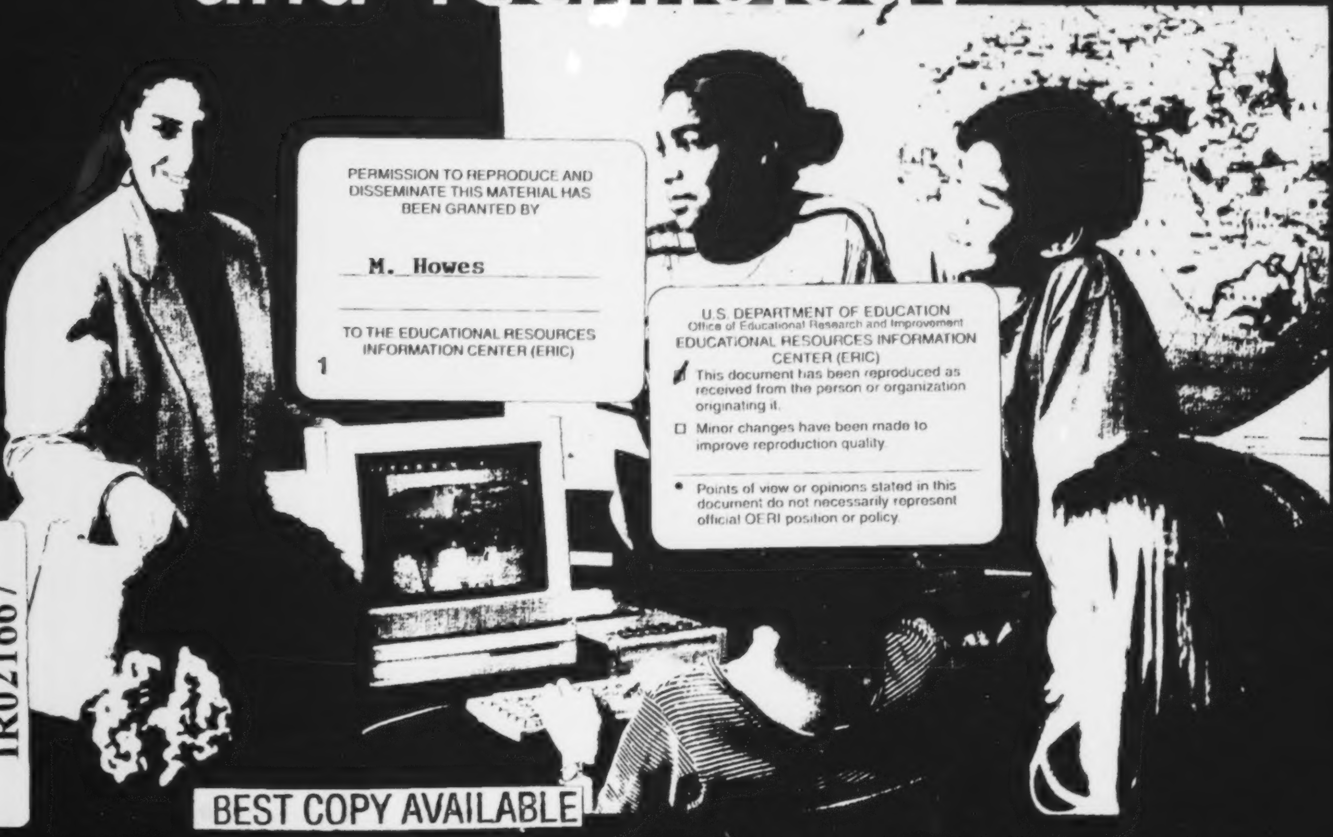
National Educational Technology

Standards for Students

Connecting Curriculum and Technology



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National Educational Technology
Standards for Students
Connecting Curriculum and Technology

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Preface

The challenge facing America's schools is the empowerment of all children to function effectively in their future, a future marked increasingly with change, information growth, and evolving technologies. Technology is a powerful tool with enormous potential for paving high-speed highways from outdated educational systems to systems capable of providing learning opportunities for all, to better serve the needs of 21st century work, communications, learning, and life.

The International Society for Technology in Education (ISTE) and the public at-large recognize the potential of technology to change education and improve student learning. Technology has become a powerful catalyst in promoting learning, communications, and life skills for economic survival in today's world. Through its National Educational Technology Standards (NETS) Project, ISTE is encouraging educational leaders to provide learning opportunities that produce technology-capable students.

WHAT IS THE NETS PROJECT?

The primary goal of the ISTE NETS Project is to enable stakeholders in PreK–12 education to develop national standards for educational uses of technology that facilitate school improvement in the United States. The NETS Project is developing standards to guide educational leaders in recognizing and addressing the essential conditions for effective use of technology to support PreK–12 education. The following sets of standards will be developed or refined:

- Technology Foundation Standards for Students (see Section 2), describing what students should know about technology and be able to do with technology.
- Connecting Curriculum and Technology (see Sections 3 and 4), providing curriculum examples of effective use of technology in teaching and learning.
- Educational Technology Support Standards, describing standards for professional development, systems, access, and support services essential to support effective use of technology. (to be developed)
- Standards for Student Assessment and Evaluation of Technology Use, describing various means of assessing student progress and evaluating the use of technology in learning and teaching. (to be developed)

The technology foundation standards for students contained in this book were originally published as a separate document (1998) and represent the first publication of the NETS Project. The first document synthesized responses to proposed educational technology standards from many groups and individuals across the nation who participated in conference sessions, technology forum meetings, Internet dialogue, and surveys. Consensus was reached using a variety of media for discussions with a wide range of stakeholders.

OTHER STANDARDS EFFORTS

The roots of the NETS Project are found in the work done by ISTE's Accreditation and Professional Standards Committee. For almost a decade, the committee has worked diligently to influence the accreditation and standards-setting agencies at the national and state levels. The committee has developed standards-related documents, adopted by NCATE and used widely in the United States in the development of teacher-education programs. These include:

- standards for accreditation of teacher preparation programs for specialization in educational computing and technology,
- unit guidelines describing essential conditions needed to support technology use in teacher preparation programs, and
- general standards for providing a foundation in technology for all teachers.

THE NETS PARTNERSHIP

The ISTE NETS Project appreciates the strong collaborative participation of both curriculum associations and partnering education organizations. This participation helped ensure that the standards were developed in consultation with a wide range of audiences. The NETS Project is especially appreciative of funding received through multiple sources. Contributors to the project include: Apple Computer, Inc., Milken Exchange on Education Technology, National Aeronautics and Space Administration (NASA), and the U.S. Department of Education.

The *National Educational Technology Standards for Students—Connecting Curriculum and Technology* represents an exciting partnership between architects of curriculum standards in English language arts, foreign language, mathematics, science, and social studies. This resulting publication provides examples demonstrating how technology can facilitate implementation of standards-based curriculum while supporting technology literacy among students. These entries are but a modest crystal on the tip of the iceberg of possibilities for technology in support of curriculum. The NETS leadership team urges each reader to contribute ideas, lessons, units, and scenarios to enrich this collection through the ISTE Web site (www.iste.org) and click Standards Projects. We thank you in advance for your contributions!

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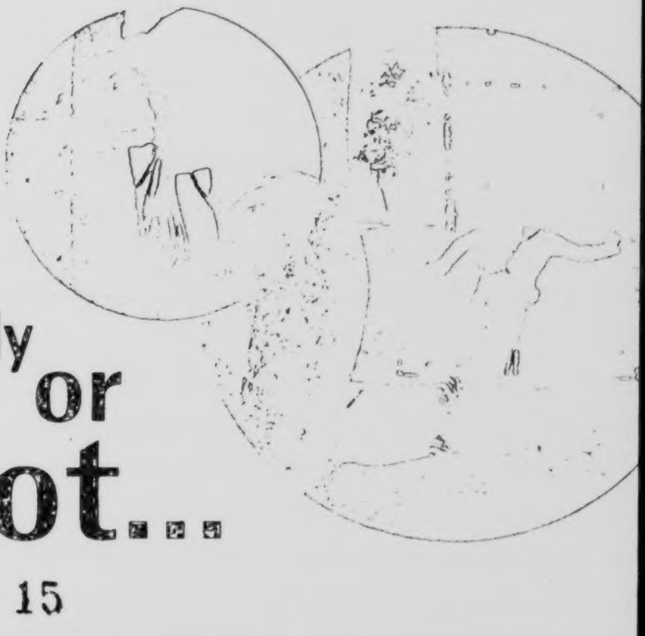
Section 1

Connecting Curriculum and Technology

- Essential Conditions to Make It Happen
- What is Curriculum Integration?
- Development of This Book
- How to Use This Book
- Beyond This Book

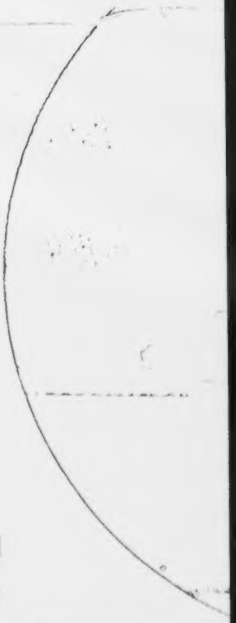


Ready or not...

Information is different

The World Is Different

Communication is different...



Our Educational System Must Produce Technology-Capable Kids

To live, learn, and work successfully in an increasingly complex and information-rich society, students must be able to use technology effectively. Within an effective educational setting, technology can enable students to become:

- *Capable information technology users*
- *Information seekers, analyzers, and evaluators*
- *Problem solvers and decision makers*
- *Creative and effective users of productivity tools*
- *Communicators, collaborators, publishers, and producers*
- *Informed, responsible, and contributing citizens*

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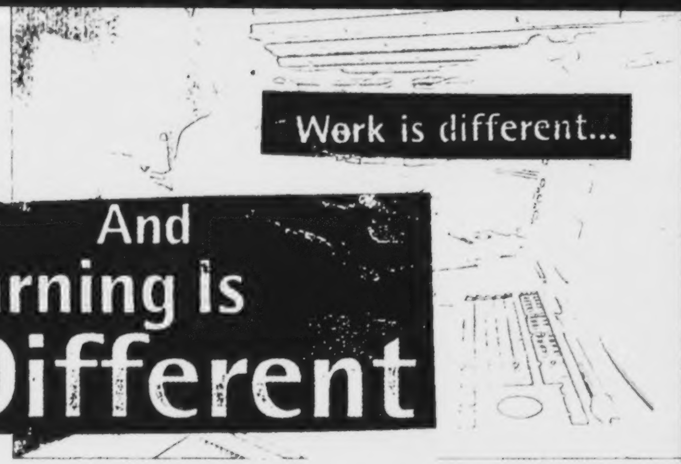

Tools are different...

Work is different...

Kids are different...

And Learning Is Different

All Children Must Be Ready for a Different World

Parents want it!

Parents want their children to graduate with skills that prepare them to either get a job in today's marketplace or advance to higher levels of education and training.

Employers want it!

Employers want to hire employees who are honest, reliable, literate, and able to reason, communicate, make decisions, and learn.

Communities want it!

Communities want schools to prepare their children to become good citizens and productive members of society in an increasingly technological and information-based world.

The nation wants it!

National leaders, the U.S. Department of Education, and other federal agencies recognize the essential role of technology in 21st century education.

AND MOST OF ALL...KIDS NEED IT!!!

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Essential Conditions to Make It Happen

Students in a Chicago elementary school recently used technology to explore the history of Ice Age animals in Illinois. Using the Internet, they "traveled" to the Illinois State Museum (200 miles away) and the Brookfield Zoo (10 miles away) to gather information and talk with experts via two-way video. The students constructed an electronic database to organize and analyze their information and shared their findings with students outside their own school through multimedia reports posted on a Web site titled "Mastodons in Our Own Backyard."

Successful learning activities, such as this, depend on more than just the technology. Certain conditions are necessary for schools to effectively use technology for learning, teaching, and educational management. Physical, human, financial, and policy dimensions greatly affect the success of technology use in schools.

A combination of essential conditions are required to create learning environments conducive to powerful uses of technology, including:

- *Vision with support and proactive leadership from the education system*
- *Educators skilled in the use of technology for learning*
- *Content standards and curriculum resources*
- *Student-centered approaches to learning*
- *Assessment of the effectiveness of technology for learning*
- *Access to contemporary technologies, software, and telecommunications networks*
- *Technical assistance for maintaining and using technology resources*
- *Community partners who provide expertise, support, and real-life interactions*
- *Ongoing financial support for sustained technology use*
- *Policies and standards supporting new learning environments*

This book is designed to provide teachers, technology planners, teacher preparation institutions, and educational decision makers with frameworks, standards, and performance indicators to guide them in establishing enriched learning environments supported by technology. These new learning environments provide rich opportunities for students to find and utilize current information and resources, and apply academic skills for solving real-world problems. These environments engage students in activities that have educational technology skills and relevant curricular content interwoven.

Traditional educational practices no longer provide students with all the necessary skills for economic survival in today's workplace. Students today must apply strategies for solving problems using appropriate tools for learning, collaborating, and communicating. The following chart lists characteristics representing traditional approaches to learning and corresponding strategies associated with new learning environments:

ESTABLISHING NEW LEARNING ENVIRONMENTS

Incorporating New Strategies

Traditional Learning Environments	New Learning Environments
Teacher-centered instruction	*Student-centered instruction*
Single-sense stimulation	*Multisensory stimulation*
Single-path progression	*Multipath progression*
Single media	*Multimedia*
Isolated work	*Collaborative work*
Information delivery	*Information exchange*
Passive learning	*Active/exploratory/inquiry-based learning*
Factual, knowledge-based learning	*Critical thinking and informed decision-making*
Reactive response	*Proactive/planned action*
Isolated, artificial context	*Authentic, real-world context*

The most effective learning environments meld traditional approaches and new approaches to facilitate learning of relevant content while addressing individual needs. The resulting learning environments should prepare students to:

- *Communicate using a variety of media and formats*
- *Access and exchange information in a variety of ways*
- *Compile, organize, analyze, and synthesize information*
- *Draw conclusions and make generalizations based on information gathered*
- *Know content and be able to locate additional information as needed*
- *Become self-directed learners*
- *Collaborate and cooperate in team efforts*
- *Interact with others in ethical and appropriate ways*

Teachers know that the wise use of technology can enrich learning environments and enable students to achieve marketable skills. It is still critical, however, that educators analyze the potential benefits of technology for learning and employ it appropriately.

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What is Curriculum Integration?

Ms. Jones uses a word processor to create student handouts, a database to keep student records, and a spreadsheet to keep track of student grades. She regularly uses the Internet to obtain lesson ideas and e-mail to keep in contact with teachers at other schools. Ms. Jones views herself as a technology-using teacher. Unfortunately, Ms. Jones's students do not use the computer in her classroom because it is considered the teacher's computer and is placed behind Ms. Jones's desk on a special table.

Ms. Jones has made the first step in becoming a technology-using teacher, by using technology for personal tasks. However, Ms. Jones's definition of a technology-using teacher is missing the vital link to truly enhancing student learning. Students must use the tools! Students using technology are actively engaged in their learning and able to create their own knowledge and accomplish their own goals. The challenge for Ms. Jones is to find ways to encourage this learning AND teach the complex, concentrated curriculum that has been outlined by her school district to meet state and national standards.

Curriculum integration with the use of technology involves the infusion of technology as a tool to enhance the learning in a content area or multidisciplinary setting. Technology enables students to learn in ways not previously possible. Effective integration of technology is achieved when students are able to select technology tools to help them obtain information in a timely manner, analyze and synthesize the information, and present it professionally. The technology should become an integral part of how the classroom functions—as accessible as all other classroom tools.

Although many teachers are moving along the continuum from being personal users of technology to finding ways to effectively use it with students, many have not moved far enough in engaging their students. The purpose of this book is to provide user-friendly lessons, activities, and instructional units that teachers can either implement as written or modify to fit their needs. The ideas contained herein have been developed and implemented by experienced teachers. The focus in each lesson or unit is the curriculum outcome, not the technology. It is through lessons such as these that the ISTE National Educational Technology Standards (NETS) for Students can be met while addressing district, state, and national curriculum standards.

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DEVELOPMENT OF THIS BOOK

How were the activities, lessons, and units developed for this book? The development and refinement of the NETS for Students took place from 1994 to 1998. Following the dissemination of the NETS for Students, the Project Leadership Team, in collaboration with the curriculum liaisons and project partners, solicited the names of teachers, teacher educators, and curriculum and technology coordinators who were deemed exemplary in the eyes of their peers in their ability to integrate the use of technology to support teaching and learning. After examining every nomination, the NETS Leadership Team selected participants to attend a week-long writing meeting to develop the sample lessons and units found in this book. These Writing Team members were selected to represent the groups identified in the following matrix:

NETS Writing Team Selection Matrix

A PreK-2 teacher with expertise in English language arts.

SUBJECT AREAS	TEACHER PreK-2	TEACHER 3-5	TEACHER 6-8	TEACHER 9-12	TEACHER EDUCATOR	DISTRICT LEVEL TECHNOLOGY COORDINATOR	OTHER INCLUDING
ENGLISH LANGUAGE ARTS	✓	✓	✓	✓	✓	✓	Librarians
MATH	✓	✓	✓	✓	✓	✓	Principals
SCIENCE	✓	✓	✓	✓	✓	✓	Special Needs
SOCIAL STUDIES	✓	✓	✓	✓	✓	✓	State Department Representatives

A Grades 6-8 teacher with expertise in science.

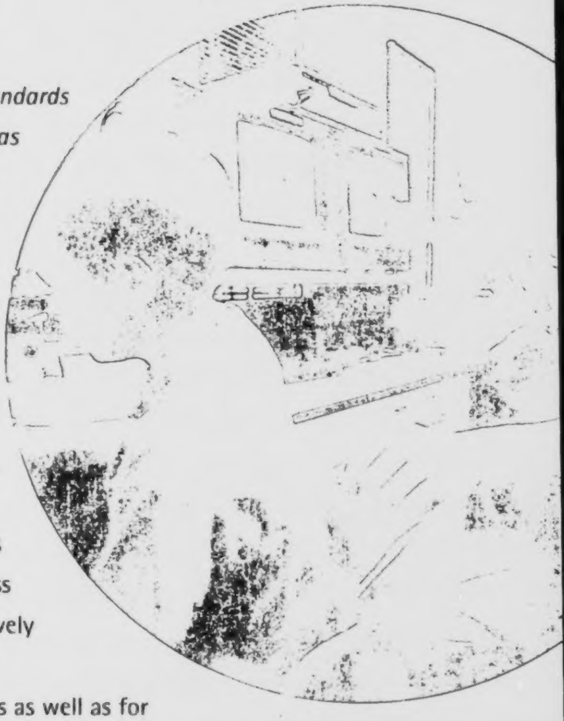
A professor with expertise in math.

The ability of Writing Team members to authoritatively discuss their grade level range, within their subject area specialization, ensured balanced multidisciplinary teams and the creation of units of instruction that weave the areas of curriculum content together.

Once the activities and units were developed, the Leadership Team conducted focus groups across the United States to determine whether or not the examples provided were useful, met student needs, and addressed the curricular content area standards. Additionally, drafts of the activities were placed on the Web for online comment. This book represents the collective work of and feedback from more than 2,000 colleagues.

How to Use This Book

The rest of this book includes technology foundation standards for students, learning activities organized by subject areas and multidisciplinary themes, various appendices, and a glossary. A description of each follows.



Section 2

NETS for Students

This section presents the National Educational Standards (NETS) for Students in their entirety, for all grade-level ranges. Detailed yet concise descriptions of the standards are included, as are brief scenarios describing what a class might look like in which the standards have been effectively implemented. Familiarity with Section 2 is important for understanding the organization of the remaining sections as well as for applying the standards to classroom instruction. To acquire a complete sense of the scope and detail of the standards, understanding Section 2 is imperative.

Section 3

Curriculum Integration

Organized around the curriculum areas of English language arts, foreign language, mathematics, science, and social studies, this section uses a sequenced set of learning activities arranged by grade level range to illustrate the connection between teaching specific disciplines and implementing the NETS standards. This section is designed so that teachers can go to a particular curriculum area and find two examples of lesson sequences that address the national standards for the discipline, as well as meet various NETS standards. Each lesson sequence includes information on resources, contact information for the authors, and a brief narrative describing the actual results of implementing the lesson sequence.

Activity Title
Curriculum Area
Grade Range Suggested

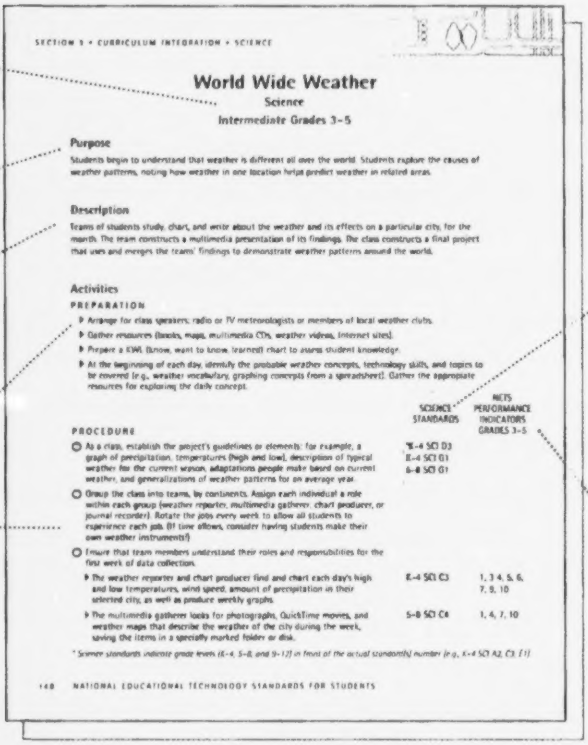
What will this activity accomplish?

A summary of what students will do

Steps to prepare for and carry out the activity

Reference to national curriculum standards (see Appendix A to look up particular standards)

Areas of the NETS performance indicators that can be addressed through this activity



SECTION 3 • CURRICULUM INTEGRATION • SCIENCE

World Wide Weather
Science
Intermediate Grades 3–5

Purpose

Students begin to understand that weather is different all over the world. Students explore the causes of weather patterns, noting how weather in one location helps predict weather in related areas.

Description

Teams of students study, chart, and write about the weather and its effects on a particular city for the month. The team constructs a multimedia presentation of its findings. The class constructs a final project that uses and merges the teams' findings to demonstrate weather patterns around the world.

Activities

PREPARATION

- Arrange for class speakers: radio or TV meteorologists or members of local weather clubs.
- Gather resources (books, maps, multimedia CDs, weather videos, Internet sites).
- Prepare a KWL (know, want to know, learned) chart to assess student knowledge.
- At the beginning of each day, identify the probable weather concepts, technology skills, and topics to be covered (e.g., weather vocabulary, graphing concepts from a spreadsheet). Gather the appropriate resources for exploring the daily concept.

PROCEDURE	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
○ As a class, establish the project's guidelines or elements: for example, a graph of precipitation, temperatures (high and low), description of typical weather for the current season, adaptations people make based on current weather, and generalizations of weather patterns for an average year.	*K–4 SCI D3 K–4 SCI G1 5–8 SCI G1	
○ Group the class into teams, by continents. Assign each individual a role within each group (weather reporter, multimedia gatherer, chart producer, or journal recorder). Rotate the jobs every week to allow all students to experience each job. (If time allows, consider having students make their own weather instruments!)		
○ Ensure that team members understand their roles and responsibilities for the first week of data collection.		
▸ The weather reporter and chart producer find and chart each day's high and low temperatures, wind speed, amount of precipitation in their selected city, as well as produce weekly graphs.	K–4 SCI C3	1, 3, 4, 5, 6, 7, 9, 10
▸ The multimedia gatherer looks for photographs, QuickTime movies, and weather maps that describe the weather of the city during the week, saving the items in a specially marked folder or disk.	5–8 SCI C6	1, 4, 7, 10

* *Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI A2, C3, F1)*

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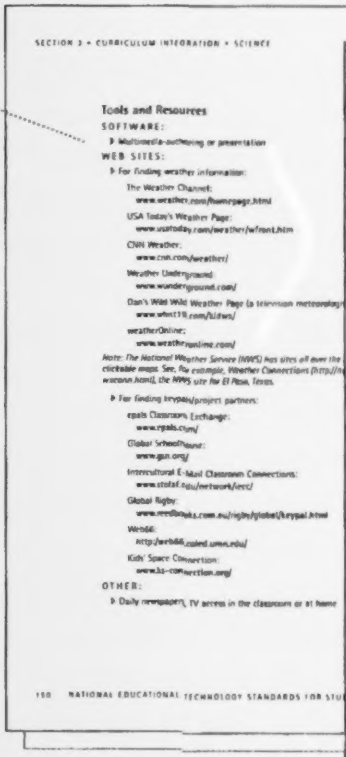
Tools and Resources to support the learning activity



SECTION 3 • CURRICULUM INTEGRATION • SCIENCE

Tools and Resources

SOFTWARE:

- Multimedia-authoring or presentation

WEB SITES:

- For finding weather information:
  The Weather Channel:
  www.weather.com/homepage.html
  USA Today's Weather Page:
  www.usatoday.com/weather/wfront.htm
  CNN Weather:
  www.cnn.com/weather/
  Weather Underground:
  www.wunderground.com/
  Dan's Wild Wild Weather Page (a television meteorolog
  www.whnt19.com/kidwx/
  weatherOnline:
  www.weatheronline.com/

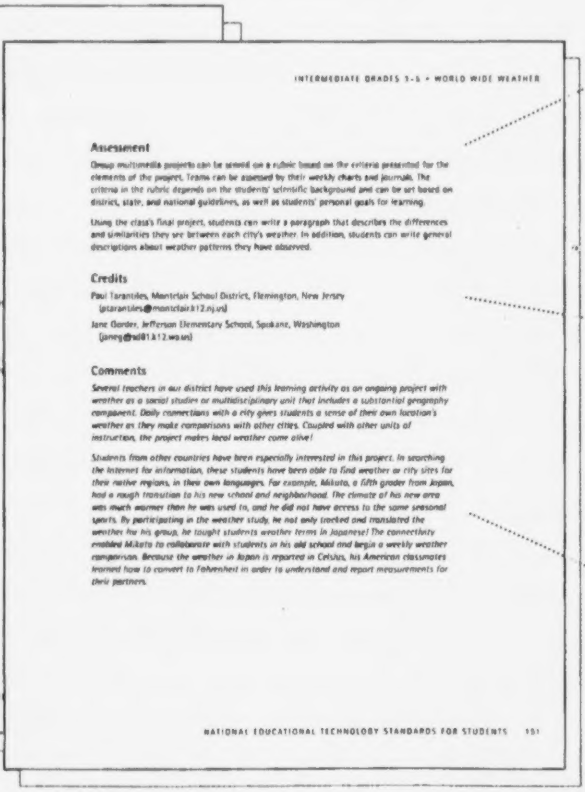
Note: The National Weather Service (NWS) has sites all over the
clickable maps. See, for example, Weather Connections (http://n
wxconn.html), the NWS site for El Paso, Texas.

- For finding keypals/project partners:
  epals Classroom Exchange:
  www.epals.com/
  Global Schoolhouse:
  www.gsn.org/
  Intercultural E-Mail Classroom Connections:
  www.stolaf.edu/network/iecc/
  Global Rigby:
  www.reedbooks.com.au/rigby/global/keypal.html
  Web66:
  http://web66.coled.umn.edu/
  Kids' Space Connection:
  www.ks-connection.org/

OTHER:

- Daily newspapers, TV access in the classroom or at home

150 NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS FOR STU



INTERMEDIATE GRADES 3–5 • WORLD WIDE WEATHER

Assessment

Group multimedia projects can be scored on a rubric based on the criteria presented for the elements of the project. Teams can be assessed by their weekly charts and journals. The criteria in the rubric depends on the students' scientific background and can be set based on district, state, and national guidelines, as well as students' personal goals for learning.

Using the class's final project, students can write a paragraph that describes the differences and similarities they see between each city's weather. In addition, students can write general descriptions about weather patterns they have observed.

Credits

Paul Tarantiles, Montclair School District, Flemington, New Jersey
(ptarantiles@montclair.k12.nj.us)
Jane Gorder, Jefferson Elementary School, Spokane, Washington
(janeg@sd81.k12.wa.us)

Comments

Several teachers in our district have used this learning activity as an ongoing project with weather as a social studies or multidisciplinary unit that includes a substantial geography component. Daily connections with a city gives students a sense of their own location's weather as they make comparisons with other cities. Coupled with other units of instruction, the project makes local weather come alive!

Students from other countries have been especially interested in this project. In searching the Internet for information, these students have been able to find weather or city sites for their native regions, in their own languages. For example, Mikoto, a fifth grader from Japan, had a rough transition to his new school and neighborhood. The climate of his new area was much warmer than he was used to, and he did not have access to the same seasonal sports. By participating in the weather study, he not only tracked and translated the weather for his group, he taught students weather terms in Japanese! The connectivity enabled Mikoto to collaborate with students in his old school and begin a weekly weather comparison. Because the weather in Japan is reported in Celsius, his American classmates learned how to convert to Fahrenheit in order to understand and report measurements for their partners.

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Ideas for assessing student learning (Be sure to involve students in developing scoring rubrics.)

Name and contact information for writer(s)

Stories or advice from writer(s)

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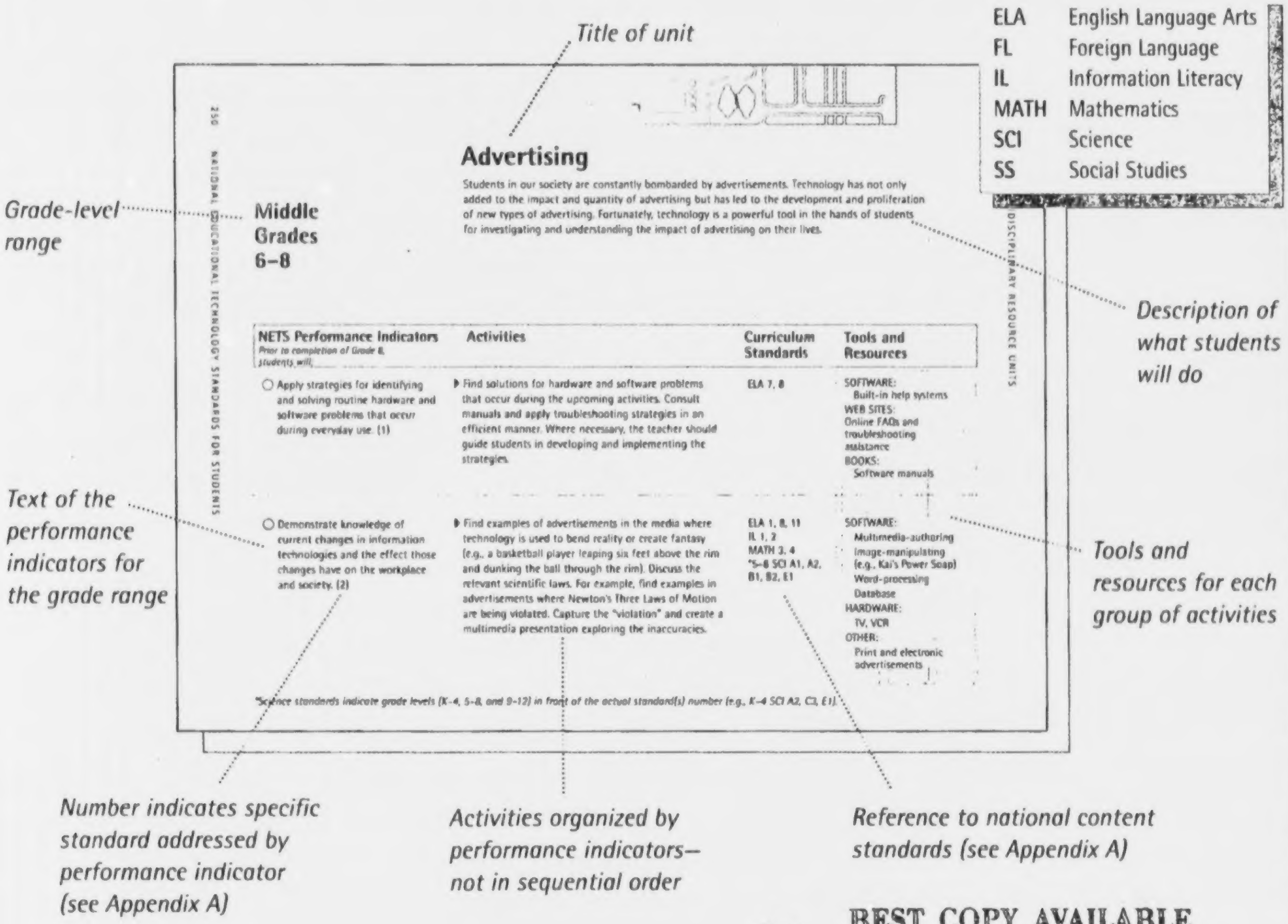
Section 4

Multidisciplinary Resource Units

Organized around grade-level ranges, each unit is sequenced by the NETS performance indicators for the grade-level range, not by teaching sequence. The units provide a series of instructional ideas that tap into many curriculum areas in support of teaching to a specific theme, big idea, or topic. These ideas should be examined by the teacher and adapted for a unit of instruction that meets specific, predetermined objectives that are in alignment with school or district guidelines. In addition to the sequencing by NETS performance indicators for the grade-level range, each unit activity has been coded by the national standards document numbering protocol for the appropriate content area to further illustrate the tie between the curriculum areas and NETS. Again, the teacher is encouraged to pick and choose activities to support a learning sequence that meets student needs and defined outcomes.


Title of unit
Grade-level range
Description of what students will do
Text of the performance indicators for the grade range
Tools and resources for each group of activities
Number indicates specific standard addressed by performance indicator (see Appendix A)
Activities organized by performance indicators—not in sequential order
Reference to national content standards (see Appendix A)
250 NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS FOR STUDENTS
DISCIPLINARY RESOURCE UNITS

ELA	English Language Arts
FL	Foreign Language
IL	Information Literacy
MATH	Mathematics
SCI	Science
SS	Social Studies

Advertising

Students in our society are constantly bombarded by advertisements. Technology has not only added to the impact and quantity of advertising but has led to the development and proliferation of new types of advertising. Fortunately, technology is a powerful tool in the hands of students for investigating and understanding the impact of advertising on their lives.

Middle Grades 6–8

NETS Performance Indicators *Prior to completion of Grade 8, students will:*	Activities	Curriculum Standards	Tools and Resources
○ Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)	▶ Find solutions for hardware and software problems that occur during the upcoming activities. Consult manuals and apply troubleshooting strategies in an efficient manner. Where necessary, the teacher should guide students in developing and implementing the strategies.	ELA 7, 8	SOFTWARE: Built-in help systems WEB SITES: Online FAQs and troubleshooting assistance BOOKS: Software manuals
○ Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)	▶ Find examples of advertisements in the media where technology is used to bend reality or create fantasy (e.g., a basketball player leaping six feet above the rim and dunking the ball through the rim). Discuss the relevant scientific laws. For example, find examples in advertisements where Newton's Three Laws of Motion are being violated. Capture the "violation" and create a multimedia presentation exploring the inaccuracies.	ELA 1, 8, 11 IL 1, 2 MATH 3, 4 *5–8 SCI A1, A2, B1, B2, E1	SOFTWARE: Multimedia-authoring Image-manipulating (e.g., Kai's Power Soap) Word-processing Database HARDWARE: TV, VCR OTHER: Print and electronic advertisements

*Science standards indicate grade levels (K-4, 5-8, and 9-12) in front of the actual standard(s) number (e.g., K-4 SCI A2, C3, E1).

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Appendices

A. Standards

This section contains a compilation of all curriculum and technology standards referred to in Sections 3 and 4. Each are approved reprints from the original documents. You will notice that the numbering method for each set of standards is unique. The numbering scheme, with the exception of the science standards, comes from the original document published by the professional association that developed the standards for the content area.

B. NETS Workshop Staging Guide

To implement the NETS for students, it is valuable to have workshops for teachers and others that focus on curriculum integration. This section contains ideas and resource materials for staging a NETS workshop. Suggestions are also provided for staging workshops that link NETS to state and district standards.

C. NETS Project Partnership

No volume of this complexity can be developed in isolation. Members of the Writing Teams, Leadership Team, partners, and liaisons are listed with contact information.

D. Resources

Valuable resources are found in this section, including books, software, contact information for software publishers and distributors, and Web sites.

Glossary

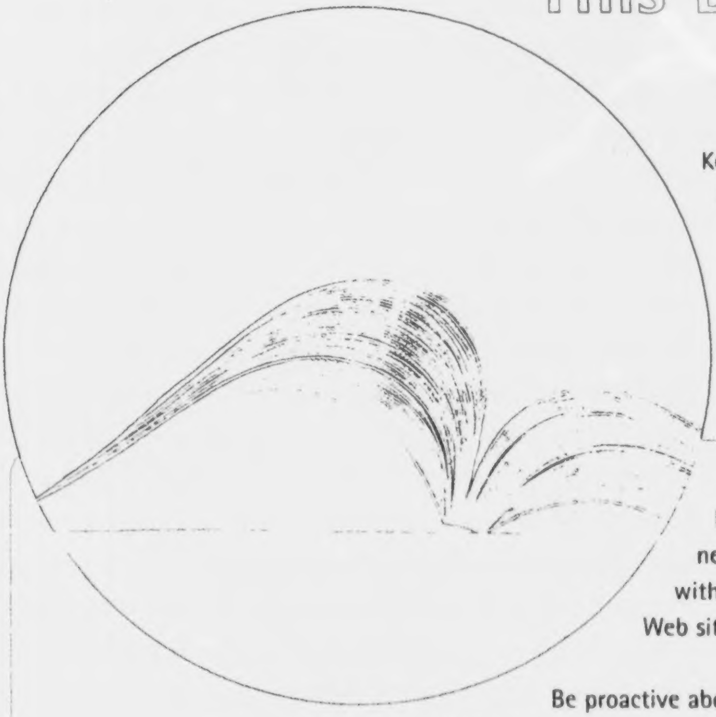
At the end of this book is a list of commonly used words that may be unfamiliar to some readers. This list is not exhaustive. It is intended to provide a starting point to supplement your technology vocabulary.

A note on the use of Web sites:

The Web sites listed in the Tools and Resources section of the learning activities and multidisciplinary units are accurate as of the publication date of this book. But Web sites do change. Please consult the ISTE Web site (www.iste.org) for any updates on Web addresses. However, if an address is a long, complex one, you can often troubleshoot changes yourself. Try connecting to a previous directory listing by eliminating a title after the last slash. For example, www.gsn.org/project/index.html, delete index.html so that the Web address now reads www.gsn.org/project/. Or try connecting to the main Web site that ends at the domain name, for example, www.gsn.org/. Then navigate your way to your desired page.

Additionally, you will notice that the protocol for printing Web site addresses is not consistent. Unfortunately, at this point in time, there is no standard. Each Web address has been checked prior to publication. Be sure to verify your typing—not excluding any slash, colon, or other marks. When unsure about case sensitivity, use lowercase letters.

Beyond This Book



Keep in mind that the authors of individual learning activities could not address the needs of every teaching situation. Take the examples contained herein and modify them to fit your circumstances and needs. The sample lessons also provide a lens for re-examining traditional lessons and discovering ways to infuse technology to enrich teaching and learning. As you are inspired to create new lessons and units, please share these with others by posting them on the ISTE Web site (www.iste.org). But that's not all!

Be proactive about sharing your good work with others. There are many lesson plan Web sites (see Appendix D) as well as school, district, professional association, and parent meetings at which to present new lesson plans and the resulting student work. Educators need to learn from their peers. Educators also need to inform parents of their efforts to integrate technology and learning; and inform the greater public about how schools are meeting the needs of students, parents, and the community.

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Section 2

National Educational Technology Standards for Students

- Technology Foundation Standards for Students
- Profiles for Technology-Literate Students: Performance Indicators, Curriculum Examples, and Scenarios
    - Grades PreK–2
    - Grades 3–5
    - Grades 6–8
    - Grades 9–12

Technology Foundation Standards for Students

The technology foundation standards for students are divided into six broad categories. Standards within each category are to be introduced, reinforced, and mastered by students. These categories provide a framework for linking performance indicators within the Profiles for Technology Literate Students to the standards. Teachers can use these standards and profiles as guidelines for planning technology-based activities in which students achieve success in learning, communication, and life skills.

Technology Foundation Standards for Students

1. **Basic operations and concepts**
    - *Students demonstrate a sound understanding of the nature and operation of technology systems.*
    - *Students are proficient in the use of technology.*
2. **Social, ethical, and human issues**
    - *Students understand the ethical, cultural, and societal issues related to technology.*
    - *Students practice responsible use of technology systems, information, and software.*
    - *Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.*
3. **Technology productivity tools**
    - *Students use technology tools to enhance learning, increase productivity, and promote creativity.*
    - *Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.*

4. Technology communications tools

- *Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.*
- *Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.*

5. Technology research tools

- *Students use technology to locate, evaluate, and collect information from a variety of sources.*
- *Students use technology tools to process data and report results.*
- *Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.*

6. Technology problem-solving and decision-making tools

- *Students use technology resources for solving problems and making informed decisions.*
- *Students employ technology in the development of strategies for solving problems in the real world.*

Profiles for Technology-Literate Students

Performance Indicators, Curriculum Examples, and Scenarios

A major component of the NETS Project is the development of a general set of profiles describing technology-literate students at key developmental points in their precollege education. These profiles reflect the underlying assumption that all students should have the opportunity to develop technology skills that support learning, personal productivity, decision making, and daily life. These profiles and associated standards provide a framework for preparing students to be lifelong learners who make informed decisions about the role of technology in their lives.

The Profiles for Technology Literate Students provide performance indicators describing the technology competence students should exhibit upon completion of the following grade ranges:

- ▷ *Grades PreK–2*
- ▷ *Grades 3–5*
- ▷ *Grades 6–8*
- ▷ *Grades 9–12*

These profiles are indicators of achievement at certain stages in PreK–12 education. They assume that technology skills are developed by coordinated activities that support learning throughout a student's education. These skills are to be introduced, reinforced, and finally mastered, and thus, integrated into an individual's personal learning and social framework. They represent essential, realistic, and attainable goals for lifelong learning and a productive citizenry.

The standards and performance indicators are based on input and feedback from educational technology experts as well as parents, teachers, and curriculum experts. In addition, they reflect information collected from professional literature and local, state, and national documents.

Technology Integration — Examples and Scenarios

Linked to each profile is an example or scenario that exemplifies the use of technology by teachers and students to facilitate learning. The scenarios describe classroom practice that reflects not only the NETS standards and profiles, but also content standards from curriculum organizations such as the National Council of Teachers of Mathematics, International Reading Association, and National Council for the Social Studies. The scenarios provide a curricular context for the use of technology to create varied learning environments being established across the United States. It is not the purpose of this book to promote the use of technology in isolation, but rather for it to be an integral component or tool for learning and communications within the context of academic subject areas.

PERFORMANCE INDICATORS FOR TECHNOLOGY-LITERATE STUDENTS

GRADES PREK–2

All students should have opportunities to demonstrate the following performances.

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are:

1. Basic operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

Prior to completion of Grade 2 students will:

1. *Use input devices (e.g., mouse, keyboard, remote control) and output devices (e.g., monitor, printer) to successfully operate computers, VCRs, audiotapes, and other technologies. (1)*
2. *Use a variety of media and technology resources for directed and independent learning activities. (1, 3)*
3. *Communicate about technology using developmentally appropriate and accurate terminology. (1)*
4. *Use developmentally appropriate multimedia resources (e.g., interactive books, educational software, elementary multimedia encyclopedias) to support learning. (1)*
5. *Work cooperatively and collaboratively with peers, family members, and others when using technology in the classroom. (2)*
6. *Demonstrate positive social and ethical behaviors when using technology. (2)*
7. *Practice responsible use of technology systems and software. (2)*
8. *Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)*
9. *Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)*
10. *Gather information and communicate with others using telecommunications, with support from teachers, family members, or student partners. (4)*

CURRICULUM EXAMPLES AND SCENARIOS

GRADES PreK–2

Scenario 1: *Animals and Their Sounds*

Grade Levels: PreK–2

Technology Profile Performance Indicators: 1, 2, 3, 4, 8, 9

Subject Areas: Reading, Science

Source: Sharon Fontenot, Prien Lake Elementary School, developed this lesson for a Louisiana Challenge Grant Leadership Program, Louisiana Tech University.

While every child may not be able to see animals in the wild, every child can see, hear, and learn about wild animals through multimedia technology. In Sharon Fontenot's class at Prien Lake Elementary School, students learn to identify polar bears, lions, and other wild animals through images, video clips, and sounds on the Wide World of Animals CD-ROM. The teacher models the creative use of technology by making a tape recording based on information from the CD-ROM, incorporating her own voice to fit the group's needs.

Students practice reading and listening skills by answering questions that encourage them to think about both the science and social living issues related to these animals. Where do these animals live? What do they eat? Why do some have thick fur? How do they interact with each other?

Students create their own stories about what they have learned using Kid Pix, a software program that allows them to make their own pictures of the animals, assemble them into slide shows, and print out their own books to share with classmates and family. The teacher videotapes the students' activities as part of their assessment and to share with students and parents.

Scenario 2: *I Lost My Tooth!*

Grade Levels: PreK–2

Technology Profile Performance Indicators: 1, 2, 4, 5, 8, 9, 10

Subject Areas: Health, Language Arts, Social Studies

Source: Boehm, D. (1997, April). I Lost My Tooth! *Learning & Leading with Technology. 24* (7), 17–19.

A first-grade teacher can use this activity to introduce her class to Internet technology. Teachers worldwide use e-mail, once a month, to relate how many teeth their students lost along with one special fact about their region or culture. Students share tooth fairy traditions and other stories from their region.

Using the information gathered from students around the world, teachers develop activities including creative writing, graphing, art, and social studies. Students use an interactive bulletin board where they post dates when teeth were lost, create a class letter about the project to post on the Internet, collect information from other children about tooth fairy stories, develop creative writing stories about their "tooth" experiences, and share them with other children via the Internet.

Students can initiate electronic conversations about where other children live, use maps to locate the countries/cities, and address topics with other children such as weather, politics, clothing, and local heroes. The students use electronic slide show/drawing software to illustrate the fairy stories and graph the tooth data. They then write a letter explaining what the graph means and send it to keypals around the world.

PERFORMANCE INDICATORS FOR TECHNOLOGY-LITERATE STUDENTS

GRADES 3–5

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 5 students will:

1. *Use keyboards and other common input and output devices (including adaptive devices when necessary) efficiently and effectively. (1)*
2. *Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide. (1, 2)*
3. *Discuss basic issues related to responsible use of technology and information and describe personal consequences of inappropriate use. (2)*
4. *Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)*
5. *Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)*
6. *Use telecommunications efficiently and effectively to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests. (4)*
7. *Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)*
8. *Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6)*
9. *Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)*
10. *Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources. (6)*

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are:

1. Basic operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

CURRICULUM EXAMPLES AND SCENARIOS

GRADES 3–5

Scenario 1:
Global Learning and Observations for a Better Environment (GLOBE)

Grade Levels: 3–5

Technology Profile Performance Indicators:
2, 3, 4, 5, 6

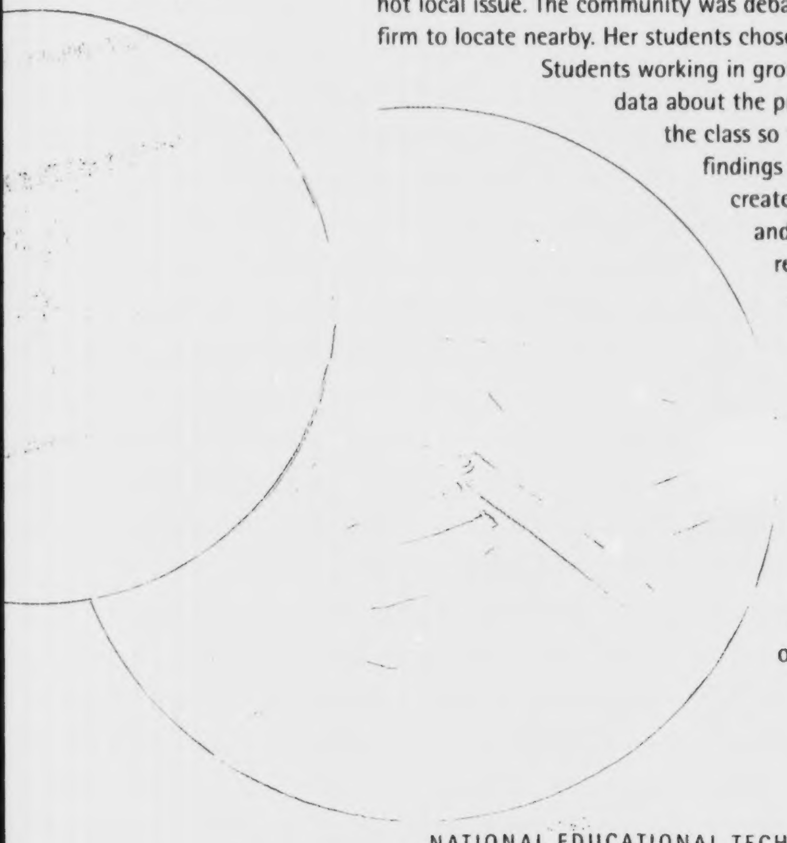
Subject Areas:
Science, Social Studies

Source:
NASA Classroom of the Future Program.

Ms. Smith and her class have made extensive use of online resources, such as Exploring the Environment (ETE) found at www.cotf.edu/ete/ and Global Learning and Observations for a Better Environment (GLOBE) found at www.globe.gov/. She uses ETE to access classroom tested problem-based learning modules that extend and sometimes replace her old paper-based activities. These self-contained resources have provided a new spark of vitality in her science and interdisciplinary classes where students grapple with real-world issues and current data.

Using the GLOBE structure, Ms. Smith has students collect information from environmental observations around the school and vicinity, report the data to a processing facility through GLOBE, and use global images created from their data to study local environmental issues. The students have been contributing to an environmental database used by research scientists to improve our understanding of the global environment.

Recently, her students used GLOBE and other electronic resources to research a hot local issue. The community was debating whether to allow a biotechnology firm to locate nearby. Her students chose to analyze this issue very carefully. Students working in groups engaged in collecting and analyzing data about the proposed plant. Ms. Smith set forums in the class so that the students could present their findings and engage in debate. Students then created Web pages to present their findings and arguments to the community. She reports that because of the authenticity and relevance of the issue, her students were even more engaged as they used technology in researching the issues. Parents were pleased to see their children's work on the school's Web site, and viewing the materials at home helped parents feel closer to what the students did in school. Parents also reported subtle changes in their children's attitudes when they were immersed in this hands-on, minds-on, technology-infused classroom.



PERFORMANCE INDICATORS FOR TECHNOLOGY-LITERATE STUDENTS

GRADES 6–8

All students should have opportunities to demonstrate the following performances.

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are:

1. **Basic operations and concepts**
2. **Social, ethical, and human issues**
3. **Technology productivity tools**
4. **Technology communications tools**
5. **Technology research tools**
6. **Technology problem-solving and decision-making tools**

Prior to completion of Grade 8 students will:

1. *Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)*
2. *Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)*
3. *Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse. (2)*
4. *Use content-specific tools, software, and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3, 5)*
5. *Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)*
6. *Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)*
7. *Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)*
8. *Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)*
9. *Demonstrate an understanding of concepts underlying hardware, software, and connectivity, and of practical applications to learning and problem solving. (1, 6)*
10. *Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)*

CURRICULUM EXAMPLES AND SCENARIOS

GRADES 6–8

Scenario 1:
Using Technology to Learn about Rocks and Minerals

Grade Levels: 8

Technology Profile Performance Indicators:
4, 5, 6, 7

Subject Areas:
Science, Social Studies

Source:
Hemmer, J. (1998, November/December). Lakeisha's year in eighth grade: Technology integration vignette, part 3. *Learning & Leading with Technology, 25* (7), 27–31.

Lakeisha's eighth-grade class began a unit on rocks and minerals. They explored topics using CD-ROM encyclopedias and stored the information they found and results from their laboratory sessions, including a weeklong rock simulation program, in their databases. When their studies were complete, Mrs. Perkins helped the students create HyperStudio presentations to share with the class. After she found an Internet site called "Ask a Geologist," Lakeisha and her classmates were able to e-mail questions about rocks and minerals to the geologists who were sponsoring the site. Lakeisha and her friends were fascinated with the information they received on rocks and minerals in their native area. Lakeisha's science teacher organized a local geologic dig to help students begin their own rock and mineral collections.

Scenario 2:
The Louisiana Labor Market Lesson

Grade Levels: 8

Technology Profile Performance Indicators:
5, 6, 7, 8

Subject Areas:
Mathematics, Social Studies

Source:
Callaway, B. (1997). Teacher and students present Louisiana labor lesson at the BESE meeting. *Louisiana Challenge Grant Newsletter, 2* (1), 9.*

**Full plan at: www.challenge.state.la.us/k12act/lp/index.html*

At Marthaville Elementary, a small rural K–8 school, Laura Strahan and her eighth-grade students studied the Louisiana labor market in their math class. Students used the Internet to access the Louisiana Department of Labor's Web site: (www.ldol.state.la.us) and search for the top 20 projected occupations in the state. The U.S. Department of Labor receives and distributes labor information from each state and updates its statistics daily.

Students were divided into groups. Each group selected five occupations and developed a survey for them. Each survey was used to query other individuals regarding the estimated annual income for those occupations. The students then assisted in analyzing the survey results, comparing results to actual salaries as reported on the Department of Labor and other Internet sites, calculating averages of estimates, and displaying the information in appropriate graph format. Students from Ms. Strahan's class presented their results to the Board of Elementary and Secondary Education to illustrate the importance of providing technology resources to schools in Louisiana.

This lesson provides numerous opportunities to use technology to access, analyze, and present information. Information is accessed using telecommunications then analyzed and presented using word-processing, database, spreadsheet, graphing, and multimedia software. The Web is used to share findings with a larger audience.

PERFORMANCE INDICATORS FOR TECHNOLOGY-LITERATE STUDENTS

GRADES 9–12

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 12 students will:

1. *Identify capabilities and limitations of contemporary and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. (2)*
2. *Make informed choices among technology systems, resources, and services. (1, 2)*
3. *Analyze advantages and disadvantages of widespread use and reliance on technology in the workplace and in society as a whole. (2)*
4. *Demonstrate and advocate for legal and ethical behaviors among peers, family, and community regarding the use of technology and information. (2)*
5. *Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)*
6. *Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)*
7. *Routinely and efficiently use online information resources to meet needs for collaboration, research, publications, communications, and productivity. (4, 5, 6)*
8. *Select and apply technology tools for research, information analysis, problem-solving, and decision-making in content learning. (4, 5)*
9. *Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)*
10. *Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)*

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are:

1. **Basic operations and concepts**
2. **Social, ethical, and human issues**
3. **Technology productivity tools**
4. **Technology communications tools**
5. **Technology research tools**
6. **Technology problem-solving and decision-making tools**

CURRICULUM EXAMPLES AND SCENARIOS

GRADES 9–12

Scenario 1:
Presidential Elections

Grade Levels: 9–12

Technology Profile Performance Indicators:
5, 7, 8

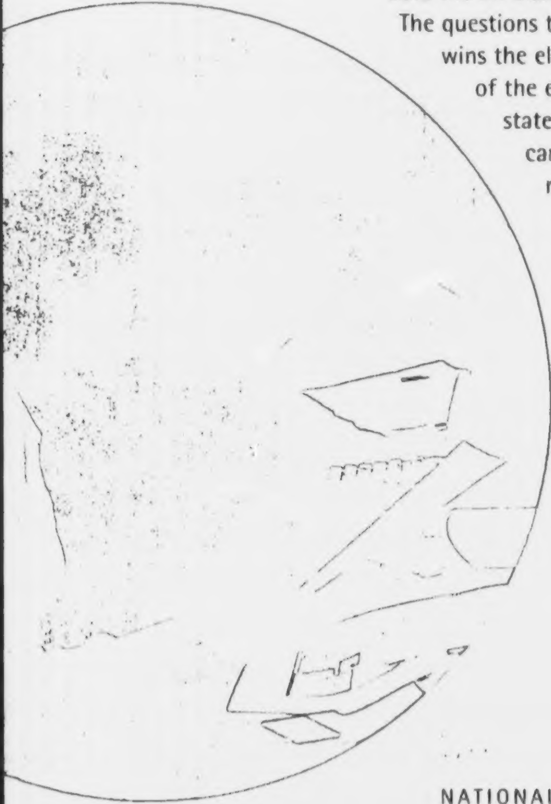
Subject Areas:
Social Studies, Language Arts, Mathematics

Source:
Based on a lesson created by a southern California teacher and presented in a class at California State University, Los Angeles.

The U.S. system of presidential elections can be a mystery for many citizens. Teaching middle school or high school students about the Electoral College can be quite a challenge. Mr. Sanchez, a high school social studies teacher in southern California, developed an activity for his students that involves election data from the closest presidential election in history—the 1960 election between John F. Kennedy and Richard M. Nixon. This activity helps students understand the Electoral College and some of the strategies used by presidential candidates. Complete, state-by-state election results can be found at the following Web site www.geocities.com/CapitolHill/6228/.

Mr. Sanchez divides his students into groups and gives each a spreadsheet containing data from the 1960 presidential election. The spreadsheet contains the popular and Electoral College results from every state and territory. Formulas at the bottom of the columns calculate the total number of popular votes and Electoral votes for each candidate.

The groups are asked to conduct a series of investigations by manipulating the spreadsheet data. Students have printouts of the original data and the original data file on disk so that they can restore the spreadsheet after each manipulation. The questions they investigate are: "Can you change the data so that Mr. Nixon wins the election rather than Mr. Kennedy?" "Can you change the outcome of the election by changing the election results in only one state?" "Two states?" "Three states?" "Can you change the popular vote so that one candidate wins the popular election but loses the Electoral College results?" "Can you change the popular vote so that the same candidate loses the popular vote but wins the election (via the Electoral College results)?" "What is the fewest number of states you can change to have one candidate win the popular vote but lose the election?" These "What if?" activities help students gain an understanding of the Electoral College.

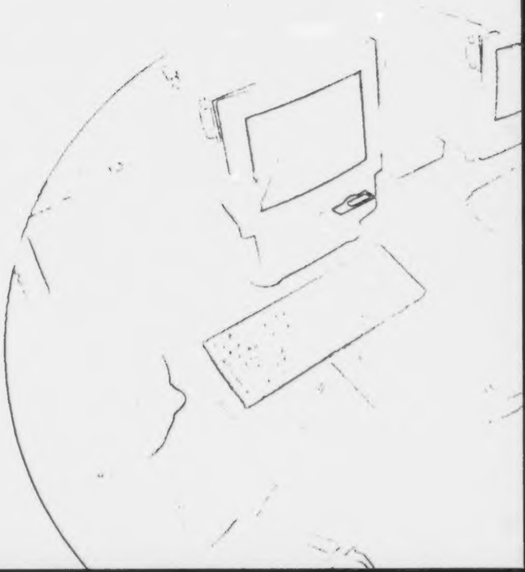


Finally, the groups prepare a multimedia report on the 1960 election using HyperStudio. These include pictures of the candidates, charts and graphs from the election (e.g., www.multied.com/elections), and a discussion of their spreadsheet manipulations.

Section 3

Curriculum Integration

- Introduction
- English Language Arts Learning Activities
- Foreign Language Learning Activities
- Mathematics Learning Activities
- Science Learning Activities
- Social Studies Learning Activities



INTRODUCTION

Curriculum Integration

The philosophy of the National Educational Technology Standards for Students is grounded in the belief that the world is changing in ways that require learning environments to change to prepare students to meet the challenges of the future. A growing body of information that students must be able to work with has changed the focus of classroom instruction. Instruction must build on basic skills so that students learn how to find, access, and assess information to address issues, some of which are yet to be defined.

The title of this section, "Curriculum Integration," is intended to convey the importance of integrating the use of technology into the curriculum. If it had been titled "Technology Integration," the reader would think that the focus is technology. In fact, the purpose of Section 3 is to focus the technology use on curriculum—discipline-specific, content-area curriculum—using technology as a tool to foster higher level outcomes.

With this in mind, there are several questions that drive how technology is used in the classroom:

- What if there is limited access to the technology?
- How can a lesson meet both curriculum standards and NETS for Students?
- How can technology be used in ways that optimize instruction?

ACCESS TO TECHNOLOGY

This book is designed for use in today's classrooms. The learning activities involve hardware and software that are commonly available. Perhaps what is most difficult is to adopt an instructional mindset that frees students to be in charge of their learning, even though they may be using rather expensive equipment! Teachers must set the instructional stage in ways that support new learning environments (see Section 1—Establishing New Learning Environments). They must also set the behavioral stage with clearly agreed upon expectations for the use of technology in the classroom. Accomplishing this will promote the use of technology in ways that positively affect instruction.

Some classrooms have computers in every corner. Some classrooms share one computer. Other classrooms have access to one or more computers, in a lab setting down the hall. Issues of access can be addressed through lesson organization and classroom management. The learning activities in this section are structured in ways that make it possible to complete an activity regardless of how students access hardware. Obviously, a one-to-one ratio of computers to students is ideal. However, although the student-to-computer ratio is dropping rapidly, the one-to-one ratio is still uncommon.

In one-computer classrooms, computers can be used as a tool for instruction in a variety of ways:

Cooperative Group Station—Assign different topics to individual groups within a larger study. Have at least two topics dependent on the use of the computer. In this way, two groups will be allotted significant time on the computer during the project. Additional time outside the group meeting time can be set aside for other groups to access resources or prepare presentations. It is important to ensure a rotation such that all students have an opportunity to participate in the technology-enriched activity.

Demonstration Station—Instruct an entire class at one time, using a large-screen monitor, LCD panel, or classroom television connected to a computer. The teacher can operate the computer and/or rotate the job of "computer engineer" between students, providing them with some hands-on experience and positive reinforcement.

Independent Research Station—Place the computer in a location that enables groups to access electronic resources, as needed. Some teachers find that a sign-up sheet promotes equitable access.

Learning Center—Position one computer as part of a well-defined activity. This station should be one within a rotation of a group of learning centers.

Schools have been installing computer labs as a way to provide cost-effective access to the Internet, from a single point, while making maximum use of a limited number of machines. Some schools have invested in a "computer teacher" who plans with the classroom teacher so that lab time fully supports classroom instruction. The team planning approach combined with the library media specialist provides a powerful model for an effective lab. Whereas many schools still use their labs solely for integrated learning system (ILS) software that tracks individual student progress in teaching basic skills, others have arranged their labs in ways that make the lab more of an extension of the classroom. There are a variety of ways to organize computer labs:

Cooperative Groups—Small groups of students work together in the lab to find specific resources or information. They can be assigned different aspects of a problem and compare online information, or do different parts of a project (e.g., preparation, searching, and desktop publishing).

Short-Term Technical Skill-Building—The lab is used as a place to teach students how to use a specific piece of software to enhance a current project. On-demand learning is most efficient when all students are able to practice the skill quickly and accurately, under the tutelage of a teacher and computer specialist.

Small Group Instruction—In this setting, small groups of students work with the teacher on a specific topic or skill while the rest of the class is engaged in another activity. Small group instruction may be electronically mediated and utilize electronic tools to check understanding.

ONE LEARNING ACTIVITY MEETS TWO SETS OF STANDARDS

The NETS for Students focuses on what students know and are able to do with technology as a tool for learning. Meeting the NETS for Students cannot be accomplished devoid of content. There must be a context in which the technology is used so that students can demonstrate their ability to meet the standards. Therefore, the learning activities in Sections 3 and 4 are cross-coded with both the curriculum area standards and the NETS for Students. It is anticipated that within the context of teaching a specific concept, technology tools will be used where appropriate. When students need instruction on how to use the technology (e.g., appropriate use, ethics, etc.), the teacher can use the curriculum context to teach the needed technology skills, then return to curriculum instruction using the technology as a tool to enhance the learning. In this way, both the content-area standards and the NETS for Students are addressed within the context of the same learning activity.

OPTIMIZING INSTRUCTION THROUGH TECHNOLOGY—ORGANIZATION OF SECTION 3

Section 3 is designed to optimize instruction by infusing the use of technology into a sample set of learning activities. The activities are designed for use in classrooms where the organization of the school or grade level is around curriculum areas. In contrast, Section 4—Multidisciplinary Resource Units is divided into major content areas with two examples at each grade-level range, within the subject.

GRADE-LEVEL RANGES ARE AS FOLLOWS:

▷ Primary grades	PreK–Grade 2
▷ Intermediate grades	Grades 3–5
▷ Middle grades	Grades 6–8
▷ Secondary grades	Grades 9–12

Each of the five curriculum areas within Section 3 is preceded by an introduction that describes the use of technology in that particular curriculum as well as an overview of the learning activities within the section. There are powerful uses for technology in the teaching and learning of other curriculum areas, such as music and art, but the main focus of this book is five subject areas:

- English Language Arts
- Foreign Language
- Mathematics
- Science
- Social Studies

Careful examination of the learning activities will reveal that Sections 3 and 4 both address the topic of *weather*. Using the same topic for a learning activity and a multidisciplinary unit was intentional, to demonstrate that a single topic can be geared for both the content-area organizational structure as well as the multidisciplinary structure. The weather learning activity can be found in the Intermediate Grades 3–5 area of the Science section. Here, the point is to look at the development of weather patterns, the inquiry method of instruction in science, and develop a general understanding of the nature of weather. The multidisciplinary unit on weather, located in the primary grades section, purposefully brings in the collection of data over time, graphing the data as the mathematical trend is examined, reading and writing about the effects of weather, studying the historical effects of weather and its effects on people's decision making, as well as the geography of weather. There is a significant amount of weather information available online, making access to the Internet imperative for gathering the latest data.

When examining the learning activities, look above and below the particular grade level for additional ideas. Keep in mind that each learning activity can be, and should be, altered to fit individual circumstances.

Readers are encouraged to share their own ideas for technology-enriched learning activities by posting them on the NETS Project Web site at www.iste.org (click the Standards Projects link), on the Web site of their local school or district, on the Web sites of professional associations, or other sites.

English Language Arts Learning Activities

▷ Introduction

▷ PreK–2 Awesome Authors

▷ PreK–2 Brrrr, It's Alive

▷ 3–5 Wall of Fame

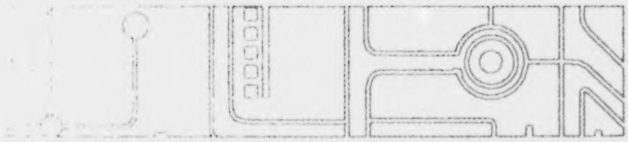
▷ 3–5 You Were There!

▷ 6–8 Birthstone Project with a Multimedia Twist

▷ 6–8 Creating a Heroic Character

▷ 9–12 Discovering Ourselves in Literature and Life

▷ 9–12 What Makes the Writer Write?



INTRODUCTION

English Language Arts Learning Activities

Literate people today must be effective communicators, critical thinkers, creative problem solvers, and lifelong learners. Students who read a wide variety of print and nonprint texts, who seek answers to meaningful questions, and who appreciate the power and diversity of language are participating as members of literacy communities. The role of English language arts educators is to enable students to develop their abilities in speaking, listening, reading, writing, viewing, and visual representation.

Technology facilitates, enhances, and expands students' abilities in all of English language arts. For example, through e-mail, videoconferencing, and Web pages students can connect, collaborate, and communicate with many audiences. By using Internet browsers and search engines, students can access a wider variety of print and nonprint resources. As students investigate multiple sources of information, they must learn to analyze, synthesize, and evaluate the authenticity, credibility, and accuracy of data, and compare written and visual images.

The *Standards for the English Language Arts**, published by the National Council of Teachers of English and the International Reading Association, emphasizes the importance of technology as a tool in literacy learning. The document recognizes that "[technology] opens up new worlds to students, making available a tremendous assortment of information, ideas, and images. It also provides new motivation for writing and allows students to assume greater responsibility for their own learning" (p. 39). Two standards in particular focus on the role of technology in English language arts education:

- ▷ Standard 7: "Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience" (p. 3).
- ▷ Standard 8: "Students use a variety of technological and informational resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge" (p. 3).

PREVIEW OF LEARNING ACTIVITIES

Technology can facilitate and enhance learning experiences in English language arts in many ways. The learning activities in this section illustrate some of the many ways in which technology can be integrated into learning environments. Teachers are encouraged to create their own examples.

In "Brrrr, It's Alive," young learners use word-processing and hypermedia software to create and share information about cold weather animals. In "Awesome Authors," students gather information about authors online and then edit, revise, and publish their own stories electronically.

At the intermediate level, teachers help students learn about the importance of point of view in both literature and history. In a learning activity titled "You Were There!" students visit Web sites to view actual documents from the period and write news stories for publication in an electronic newspaper. The "Wall of Fame" learning activity demonstrates how biographies of famous people can motivate reluctant students to read. Students locate, evaluate, and collect information and use a variety of media to communicate ideas effectively.

At the middle school level, English language arts students use video interviews, hypermedia stacks, Web pages, and other technologies to conceptualize and create multimedia representations of a hero or heroine. In the "Birthstone Project with a Multimedia Twist," students work collaboratively on Internet-based research about their birthstones and learn advanced word-processing skills to create hypermedia reports that can be shared with a wide variety of audiences.

In "What Makes the Writer Write?" high school students use Web-based information resources to research Charles Dickens: his life, his times, his style, and his use of figurative language. A variety of media are used to gather information, make observations, and analyze, report, and illustrate the results of group work. In "Discovering Ourselves in Literature and Life," students read literature and review a variety of media productions to explore the thematic question: "Who am I?" Students create their own multimedia portfolios and develop their own personal home pages to reflect who they are.

*Standards for the English Language Arts. (1996). Urbana, IL: National Council of Teachers of English/International Reading Association.

Awesome Authors

English Language Arts

Primary Grades PreK–2

Purpose

Students will:

- Use spoken, written, and visual language to communicate effectively with a variety of audiences
- Use a variety of technological and information resources to gather and synthesize information, and create and communicate knowledge
- Read a wide range of print and nonprint materials to build an understanding of texts and acquire new information
- Apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts
- Use a wide range of writing strategies and use different writing process elements to communicate with different audiences for various purposes
- Apply knowledge of language conventions and media critiques to discuss print and nonprint materials

Description

To young students, an author of a book or story often does not seem like a real person. In this activity, students learn about an author, read stories by the author, and later communicate with the author. They work in small groups to learn about plot development (beginning, middle, and end), character development, story structure, and creating parallel stories. Students are introduced to illustrations and associated copyright issues. They then write and illustrate their own stories, incorporating a character from one of the author's stories, or generate a parallel story. Students edit, revise, and publish their stories electronically. Parents and other students are encouraged to read and respond to students' published stories. Students are introduced to interviewing and questioning techniques. They work with a partner, read the partner's story, and generate questions to ask the author. Videotaped author interviews are conducted with students questioning their peer authors.

Activities

PREPARATION

- Meet with the school library media specialist to identify an author to be studied.
- Identify available resources on or about the author (e.g., video, Web sites, print, CD-ROMs, software, audiotapes, laserdiscs).
- Locate and highlight the author's Web site (if available).
- Assemble a list or a collection of the author's books to use as an introduction.
- Prepare lessons on plot and character development or a lesson on story structure for students who will write parallel stories (same plot, different characters, setting, and so on).
- Prepare a minilesson sequence on techniques for interviewing, assembling questions, and reporting information from an interview.
- Plan an electronic meeting with the author (e.g., through e-mail, CU-SeeMe, a Web site, Internet chat, Scholastic Network).
- Ask in advance if the author is willing to record a story in his or her own voice.

- Prepare a minilesson on characters and plot.
- Discuss copyright and its importance when considering illustrations.
- Discuss illustrators and illustrations. Identify style, composition, color, and media used by the author or illustrator.
- Set aside time to confer with individual students about their stories.
- Prepare a minilesson on electronic-publishing software.
- Alert the school Webmaster that student projects are intended for posting on the school Web site. Share the project timeline with the Webmaster.
- Introduce students to the video camcorder and the fundamentals of recording.

PROCEDURE

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK-2
① Introduce the class to the selected author. In the library, find books and other media about the selected author. Let students select their own books to read, but encourage them to select one by the author.	ELA 1, 3	2, 4
② Help students read about the author and become familiar with the author's life and writing.	ELA 1, 3	2, 4
③ Read and view a variety of stories by the selected author. Work in small groups to identify story plots and character features.	ELA 1, 3, 6, 11	2, 4, 5
④ Work in small groups to create a dramatization or develop a reader's theater presentation based on a story by the author. Use a video camcorder to record student presentations for viewing by the whole class.	ELA 3, 4, 5, 11, 12	1, 9
⑤ Facilitate a brainstorming session for students to describe what they have learned about the author and what they still need to learn. Record what students have learned about the author and his or her work. Categorize and classify information students shared using concept-mapping software. If possible, share students' perceptions with the author.	ELA 3, 6, 7, 11, 12	1, 2, 4, 10
⑥ Plan a video or online conference with the author. Use a word processor to record questions to ask the author during the electronic conference or e-mail interview.	ELA 4, 5	1, 9
⑦ Participate in an online conference with the selected author.	ELA 8, 11, 12	6, 10
⑧ Have students select a character from one of the stories they have read and include the character in a short story of their own. Students use electronic-publishing software to write and illustrate a story that parallels the author's story structure. Have students or adult helpers print copies of the stories for friends, family, and the library.	ELA 4, 5, 6, 11, 12	1, 2, 8, 9
⑨ Divide students into teams of three to develop questions and make plans to interview a peer author. Create a situation where students assume the role of a famous author. Set the scene such as a talk show or book signing. Students take turns trying on the following roles: author being interviewed about a story, interviewer, and cameraperson who is making sure that the camera angles are correct and that the interview is properly recorded on video. (Ask for assistance from another adult or from an older student.) Compile all videos onto a single tape for distribution to parents and families.	ELA 8, 11	1, 2, 5, 7, 8, 9

Tools and Resources

SOFTWARE:

- ▷ Concept-mapping (e.g., Expression, Inspiration®), multimedia-authoring and presentation (e.g., HyperStudio, Kid Pix Studio), desktop-publishing (e.g., Easy Book, Kid Works Deluxe)

HARDWARE:

- ▷ Video camcorder, TV, VCR

WEB SITES:

- ▷ Teacher Resources

  Go Places with Suse MacDonald (children's book author and illustrator):
  http://create4kids.com/

  Celebrating Cultures with Tomie de Paola:
  www.memphis-schools.k12.tn.us/admin/tlapages/cultures.html

  Children's Literature (reviews):
  www.childrenslit.com/home.htm

  Carol Hurst's Literature Site (reviews):
  www.carolhurst.com/

  Authors and Illustrators on the Web (guide):
  www.acs.ucalgary.ca/~dkbrown/authors.html

  Aaron Shepard's RT Page (reader's theater):
  www.aaronshep.com/rt/

  Index to Internet Sites—Children's and Young Adults' Authors and Illustrators:
  http://falcon.jmu.edu/~ramseyil/biochildhome.htm

  Scholastic Network:
  www.scholasticnetwork.com/

  Children's Book Council:
  www.cbcbooks.org/navigation/autindex.htm

  Internet Public Library:
  www.ipl.org/youth/AskAuthor/

  New York Public Library:
  www.nypl.org/branch/kids/authorchat.html

  Read In!:
  www.readin.org/

- ▷ Author Sites

  Jan Brett: **www.janbrett.com/**

  Marc Brown's Arthur site: **www.pbs.org/wgbh/arthur/**

  Eric Carle: **www.eric-carle.com/**

  Janet Stevens: **www.janetstevens.com/**

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Dr. Seuss: **http://randomhouse.com/seussville/**

Leo and Diane Dillon: **www.best.com/~libros/dillon/**

Robert Quackenbush: **www.rquackenbush.com/**

Mike Artell: **http://members.aol.com/mikeartell/page/index.htm**

Judy Blume: **http://judyblume.com/home.html**

OTHER:

- Library reference materials, both print and nonprint (books, videos, CD-ROMs)

Assessment

Assess students on (1) their ability to work cooperatively in small groups and (2) their participation and contribution to the online author conference.

Develop a rubric to assess individual student stories. The rubric should cover mechanics, content, voice, grammar, spelling, characterization, plot, and the effective use of writing and multimedia-authoring software. Review the rubric with students before beginning the project. (Tie the levels and content of the rubric to state and local standards for writing, as well as to expectations for students.)

With students, develop a rubric to evaluate their performance during the preparation and production of peer author interviews. The rubric should address preparation, quality, appropriateness of interview questions, and basic video camcorder usage and technique.

Credits

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Comments

For a long time, not much information seemed to be available on Dr. Seuss. Through the Web site, my students were able to find more biographical information. They wanted to interview him, but Geisel had recently died. With further research, they were surprised to learn just how much his foundation supports kids and reading. The class went into such a frenzy reading his books and talking about where all the money goes from buying the books that they asked the librarian to have a picture of the Cat and the Hat painted on the wall outside the library—which she did! Now those same kids are in fourth grade and I hear them pass the library chatting about Theodore Geisel and the reading programs supported by his legacy. It has been a great way to learn about stewardship as well as the notion that good writers can support themselves and some professional athletes!

Brrrr, It's Alive

English Language Arts

Primary Grades PreK–2

Purpose

Students will:

- Use oral, written, and visual language to communicate effectively with a variety of audiences for different purposes
- Use a variety of technological resources to gather and synthesize information
- Use a variety of technological resources to create and communicate knowledge
- Read a range of print materials to build an understanding of texts and acquire new information. Write in two forms: riddle and report.

Description

Guessing riddles is something primary grade students always enjoy. The creation of riddles requires children to think analytically about what they are describing and provide enough information to distinguish it from other similar things. In this activity, students write a riddle that gives clues about an animal. Other students try to guess the animal's identity. The information gathered to create the riddle forms the foundation for writing a report about cold weather animals. Students learn to organize information they have found about a cold weather animal and then add details and organize their information with an electronic web or outline. Students then create text and an illustration, or scan an image that correlates with the text. The project culminates with a combined product—an electronic presentation—that includes all of the students' information. Because this activity focuses on the effective use of language, be sure to provide additional resources and media that will aid comprehension for students whose first language is not English.

Activities

PREPARATION

- Consult the library media specialist for available resources. Select magazines, books, Web sites, and so on.
- Demonstrate how to create a web. Use concept-mapping software such as Expression or Inspiration®.
- Schedule time to confer with students individually or in small groups about their animal choices.
- To facilitate students' construction of web outlines and electronic writing, schedule extra volunteers in the classroom on those days.
- Demonstrate scanning and review drawing software.
- Notify the school Webmaster about the students' projects, providing an approximate timeline.
- Consider combining all of the projects into one electronic format to facilitate sharing and dissemination.

PROCEDURE

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK-2
① Have students brainstorm what they already know about animals that live in cold weather climates and what more they want to learn (KWL–Know/Want to Know/Learned chart). Stimulate discussion about what the term *cold* means. Provide students with a short introduction to resources they can use to acquire information. Encourage them to browse through selected materials: nonfiction books, CD-ROMs, instructional television programs, electronic encyclopedias, and appropriate Web sites.	ELA 1, 8 IL 1	2, 4
② Make sure that enough cold weather animals are available with information sources so that each student can select one for study. Have students gather materials they can use from selected resources.	ELA 3, 8, 11	2, 4
③ In table groups, have students share (a) what they have learned so far about their animals; (b) how they are classifying the animals (e.g., by specific cold weather climates); and (c) how they can help share resources that they come across for animals being studied by other members of the table group.	ELA 3	
④ Review the parts of a riddle, what makes one interesting, and what constitutes a good question. Have students use word-processing software to write a riddle about the animals they have chosen.	ELA 4, 5, 6, 8	1, 7
⑤ Have students electronically illustrate their animals in ways that do not give away the animals' identities.	ELA 4, 8	1, 8, 9
⑥ Have students read their riddles aloud and have other students guess the animal.	ELA 4, 12	
⑦ The riddles should demonstrate what kinds of facts students can gather about their animals. The class then brainstorms common attributes for cold weather animals. Students check to see which attributes are true for all their animals while using concept-mapping software to make a web of the common attributes.	ELA 3	
⑧ Students choose four attributes to use for their own reports. They find at least three details for each topic they have chosen and add that information to the web. Coach students on switching from web view to outline view in the software.	ELA 3, 5, 7	1, 2, 4, 8, 9
⑨ Students work from the web or diagram to write a report or story in electronic format for a newspaper or class publication.	ELA 3, 4, 6, 8	1, 4, 8, 9
⑩ Projects (both riddle and story or report) can be shared by posting on the school or class Web site, by making a hard copy for the media center, or by transferring the electronic format to videotape for students to view at home with their families.	ELA 8, 11, 12	1, 8, 9

Tools and Resources

SOFTWARE:

- ▷ Word-processing, concept-mapping, multimedia-authoring, multimedia encyclopedia, San Diego Zoo Presents: The Animals! (Mindscape), Amazing Animals (DK Multimedia)

WEB SITES:

Cincinnati Zoo:
www.cincyzoo.org/

Alaska Department of Fish and Game:
www.state.ak.us/local/akpages/FISH.GAME/adfghome.htm

Biological Information about Lemmings:
http://stud1.tuwien.ac.at/~e8826423/LemmZool.html

Moose:
www.ptialaska.net/~bundyd/moose.html

The Polar Bear and the Walrus:
www.teelfamily.com/activities/polarbear/

The Alaska Zoo:
www.goworldnet.com/akzoo.htm

Wolves:
http://flash.lakeheadu.ca/~kcameron/wolves~1.html

OTHER:

- ▷ Nonfiction books about animals, magazines, instructional television programs broadcast locally about animals

Assessment

Provide each student with a checklist for the teacher to sign for web and diagram activities.

Assess the writing of the report for both content, accuracy, and mechanics. Create a dual scoring rubric that is consistent with current student levels.

Have students help create and modify a rubric for assessing electronic information, including text content, graphics, illustrations, and creativity; use a scale of excellent, good, fair, and poor.

Credits

Barbara Ridgway, Helena Public Schools, Helena, Montana
(bridgway@helena.k12.ca.us)

JoAnn Gadicke, Sheboygan Area School District, Sheboygan, Wisconsin
(jgadicke@sheboygan.k12.wi.us)

Comments

The variety of ways in which students can express themselves has been particularly helpful to those who are uncomfortable with extensive writing or who prefer to produce illustrations or graphics to convey their messages. The mixture of individual and group activities offers a good balance for this level. This activity can be adapted for a whole class using one animal or with students working in cooperative or collaborative groups. Younger students can dramatize an animal by taking a digital image of one student imitating the animal.

Wall of Fame

English Language Arts

Intermediate Grades 3–5

Purpose

Students will locate, evaluate, and collect information from a variety of sources. Students will use a variety of media and formats to communicate information and ideas effectively to an audience.

Description

Reading biographies is one way reluctant readers can be motivated to read and comprehend. The story of a real person's life is often more interesting to students than a fictional character with a life that is too good to be true.

In this learning activity, students read and do research in the biography genre to look for common characteristics and actions that make famous people great. Students analyze the person's life for his or her outstanding contributions to society, and then develop a symbol to represent that contribution as part of a grade-level artistic representation of famous people.

Activities

PREPARATION

- Collaborate with the library media specialist to schedule time for students to select books from the biography collection and to conduct electronic research.
- Select a variety of biographical Web sites for student use.
- Develop guidelines for the multimedia presentation and an initial rubric for assessing the presentation.
- Meet with the art teacher, mentor, or specialist to plan the symbol development activity. Gather a variety of art materials and tools for the symbol creation process.
- Solicit and schedule participation by parents and other staff members to evaluate symbols.

PROCEDURE	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
① To engage students, have them research several famous people from different times and cultures using a variety of Web sites, electronic resources, and print reference works (e.g., encyclopedias, databases, collections of biographies).	ELA 1, 3, 7, 8, 9	1, 2, 4, 6, 8, 10
② Students present their findings and reflect on what makes a person famous or great. At this stage, the presentations can be created electronically or simply be given as quick oral reports. (The time spent and level of sophistication depends on each class's objectives.)	ELA 3, 4, 11	
③ Based on the findings, develop class criteria for fame or greatness.	ELA 11	
④ Working alone or in small groups, students select an individual biography to read. Students also look for information on their person using the Web sites and electronic resources used in the first activity. Using the information they have located and their criteria, students determine the important aspects of the person's life. Students can complete this work during Silent Sustained Reading (SSR) time.	ELA 2, 11	
⑤ On a class Wall of Fame timeline, have students place pictures of their famous people in the most appropriate decades. Have students place pictures of their famous people, and flag pins for their places of birth, on a large wall map of the world.	ELA 3, 12	
⑥ Have students discuss what a symbol is and how it can represent important characteristics of a person or place. Use examples such as an apple with numbers for a math teacher, palm trees for a city, and so on. Have students design a personal symbol for their famous person. Students may use clip art or participate in an art lesson focusing on technique and design features. The creation of a personal symbol for the selected person can be added to the Wall of Fame timeline.	ELA 4, 12	
⑦ Students or groups develop a multimedia presentation on the famous person's life, to share with classmates, emphasizing characteristics and actions that make the person famous. Present this to the entire class. Students can evaluate each person presented using the agreed upon criteria for fame.	ELA 4, 5, 6, 8, 12 IL 3, 5	1, 2, 4, 5, 9, 10

Tools and Resources

SOFTWARE:

- Multimedia encyclopedia, Kid Pix Studio or other graphics

WEB SITES:

Role Model on the Web (current figures):
www.newsltr.com/rolemodel/welcome.html

The White House:
www.whitehouse.gov/
(Click White House History and Tours for information on presidents and first ladies.)

Presidential Libraries:
www.nara.gov/nara/president/address.html

POTUS (Presidents of the United States):
www.ipl.org/ref/POTUS/

Super Scientists:
www.energy.ca.gov/education/scientists/

National Women's History Project:
www.nwhp.org/

Classical Insites' Hall of Fame (classical musicians and composers):
www.classicalinsites.com/live/hallfame/

The American West (cowboys, outlaws, authors, and frontiersmen and -women of the states west of the Mississippi River):
www.AmericanWest.com/

The Internet African American History Challenge (19th-century African Americans):
www.brightmoments.com/blackhistory/

Find a Poet (Academy of American Poets):
www.poets.org/LIT/findfst.htm

Great Renaissance and Impressionist Artists:
www.geocities.com/BourbonStreet/Delta/2165/

American Biography (biographies written by middle school students):
www.gms.ocps.k12.fl.us/biopage/bio.html

OTHER:

- Art supplies for a variety of media: paint, clay, paper, junk objects, glue, paste, scissors, pencils, markers, crayons, pens, ink, brushes, sculpting tools, construction paper, and so on; collection of individual biographies; print reference materials on biography

Assessment

Students evaluate each other's presentations about famous people to see if the chosen individuals meet the class set of criteria for fame or greatness. Develop a rubric with students for this evaluation.

Set criteria in the rubric for the format of students' multimedia presentations.

Parents, students, and other staff members provide input on how well the symbols have been used on the Wall of Fame timeline by matching names and symbols, without help. Their success rate in matching names and symbols will be evidence of the students' level of achievement.

Credits

Erlene Bishop Killeen, Library Media Specialist, Fox Prairie Elementary, Stoughton, Wisconsin (killeen3@aol.com)

Comments

The fourth graders at Fox Prairie Elementary, in Stoughton, Wisconsin, have researched famous people as part of their reading and language arts program while using "Meeting the Challenge," a reading unit text. They have developed criteria for fame and artistically represented their chosen famous people in a Wall of Fame each year. Their ability to use both electronic and print resources has developed well through this activity. In addition, their recognition of names as well as a sense of history has increased tremendously. Some of the most reluctant readers, even those who seemed only to look up to athletic heroes, gained a tremendous appreciation for the deep commitment of other heroes to things like improving life for others, creating something that makes life easier, or being good decision makers in times of trouble. This project broadened the students' views of the type of contributions that people can make to the world.

You Were There!

English Language Arts

Intermediate Grades 3–5

Purpose

Students read for point of view (POV) as they study a historical fiction novel, original source documents, and other sources of information. Students produce both a written and visual account of an event that advances their own point of view.

Description

Note: Although the novel selected for this lesson sequence is appropriate for the fifth grade, consider examining the technology-related options to revise the sequence to fit a grade-designated core literature selection.

Using literature to enhance social studies units by adding personal stories is a way to hook students into understanding the point of view of people of a particular time. Students read about the Boston Massacre through the historical fiction novel *My Brother Sam Is Dead* by James and Christopher Collier, factual texts, and other documents related to the event. Students enjoy visiting Web sites to view actual documents from the period. After evaluating, analyzing, and synthesizing the information in the documents and sites, students (1) write an article for publication in a classroom political newspaper; (2) produce a multimedia eulogy for one of the Boston Massacre victims; and (3) develop and present a group video "on-the-scene" report of the Boston Massacre.

Activities	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
① Begin this activity by reading together Chapter 1 in *My Brother Sam Is Dead* and discussing the characters' POV.	ELA 1, 6, 7, 8, 9, 11	1, 2, 3, 4
② Assign or allow students to select a specific point of view of the incident. Investigate other accounts and documents at predetermined Web sites using each team's assigned POV.	ELA 2, 3, 7, 8	3, 6, 9, 10
③ Teams produce on-the-scene video accounts of the Boston Massacre. Either the "RBC" (Redcoat Broadcasting Company) or the "LTBC" (Liberty Tree Broadcasting Company) sponsors each group. As chair of the editorial review board, join board members (selected students) to screen all videos. The account should be from the POV of the reporter who represents the view selected for the group.	ELA 4, 5, 6, 8, 9, 11, 12	1, 4, 5, 9, 10
④ Have individual or groups of students produce a word-processed newspaper article that supports their political POV. Articles are to be published in one of two class newspapers: *Redcoat Daily Gazette* or *Liberty Tree Press*. The editorial review board will screen all articles.	ELA 4, 5, 6, 12	4, 5

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
⑤ Students each draw the name of a massacre victim. Using multimedia software (e.g., HyperStudio, PowerPoint, or mPower), students develop several testimonials for their victim from the perspective of survivors who knew the victim well. Each stack should include the following: the victim's name, date of birth and death, image of the grave site (actual or student-visualized and -generated), drawing of the victim, and voice or text testimonials. At least one of the testimonials should be written from the POV of a surviving female (e.g., wife, sister, aunt) to help clarify the role of women in this event. The presentations can be part of a parent evening, shared with another classroom, or shared over the Internet with other students. (The violent nature of the deaths may be a concern to some students. The activity, however, should keep the focus on the humanness of each victim rather than how they died. The activity does involve violence, but when students see the victims as human beings like themselves and not as statistics, they are more likely to see violence for what it really is and less likely to glorify it.) Examples of researched information: *(1) Mr. Samuel Gray, killed on the spot by a ball entering his head; (2) Crispus Attucks, a mulatto, killed on the spot, two balls entering his breast; (3) Mr. James Caldwell, killed on the spot, by two balls entering his back; (4) Mr. Samuel Maverick, a youth of 17 years of age, mortally wounded; he died the next morning.*	ELA 4, 5, 6, 8, 12	1, 4, 5, 6, 9
⑥ Team members present their final products to various audiences (entire class, cross-grade-level classes, parents, interested community members).	ELA 4, 8, 11, 12	
⑦ Consider the following extensions:		
▷ E-mail with a class in the Boston area	ELA 8	
▷ Create a digital walking tour of grave sites	ELA 4, 7, 8	
▷ Do grave rubbings (be sure to get permission)		
▷ Create a market to exchange products	ELA 7	
▷ Write a song to a popular tune that tells the "real" story of the Boston Massacre	ELA 7	

Tools and Resources

SOFTWARE:

- Word-processing, multimedia-authoring, video-production

HARDWARE:

- At least one multimedia computer with audiovisual input-output capability, digital or analog video camcorder, presentation system

WEB SITES:

The Boston Massacre—A Behind-the-Scenes Look at Paul Revere's Most Famous Engraving:
www.earlyamerica.com/review/winter96/massacre.html

Anonymous Account of the Boston Massacre (background information, inflammatory first paragraph, list of the killed and wounded):
http://odur.let.rug.nl/~usa/D/1751-1775/bostonmassacre/anon.htm

Find a Grave—Boston Massacre Victims (actual photos of grave sites):
www.findagrave.com/pictures/bostonmassacre.html
(select Crispus Attucks for a readable close-up image)

National History Day:
www.thehistorynet.com/NationalHistoryDay/
(The site changes from year to year depending on the topic of the History Day activities.)

Boston National Historical Park Virtual Visitor Center:
www.nps.gov/bost/home.htm

The Plumb Design Visual Thesaurus:
www.plumbdesign.com/thesaurus/
(Students can use online thesaurus to understand Web key concept words such as *massacre*, *patriotic*, and *loyal*.)

The Revolutionary War and Children's Literature (excellent activities and literature linked to the Revolutionary War):
www.carolhurst.com/subjects/ushistory/revolution.html

BOOK:

- Collier, J., & Collier, C. (1996). *My brother Sam is dead.* New York: Scholastic Inc.

Assessment

Evaluate individual student news articles based on a class-generated rubric that includes criteria such as: following the five W's and one H of a news article, writing from the POV of Loyalist or Patriot, and using period vocabulary. Create the rubric based on school or district guidelines, grade-level objectives for the lesson sequence, and a student assessment conducted at the start of the lesson sequence.

Evaluate student eulogies on a rubric. Criteria might include having a minimum number of cards or slides in a stack, design elements, ease of use, and including all elements required by the project.

Evaluate groups on their video production using a class-generated rubric that includes criteria such as clarity, creativity of the scene, and representing the perspective of the sponsoring agency.

Credits

Paula Conley, Coeur d'Alene District No. 271, Coeur d'Alene, Idaho
(pconley@sd271.k12.id.us)

Comments

I have used this unit in my classroom for several years. Infusing a required unit with technology never fails to produce highly motivated students. By the conclusion of these projects, the students understand the concepts of propaganda and point of view in historical events. The excitement generated by the activities even carries beyond the classroom walls: I have heard students planning and discussing their newspaper articles and videos out on the playground! History comes alive and the students are involved—a guarantee for success.

Birthstone Project with a Multimedia Twist

English Language Arts

Middle Grades 6–8

Purpose

English language arts, science, and technology come together in a meaningful way through research and writing about personal birthstones. Students focus on planning and pacing to build their study skills.

Description

This lesson sequence is designed to be an interdisciplinary project for an English language arts teacher, an earth science teacher, and if possible, a technology teacher. The lessons focus on English and language arts as the vehicle for expression and analysis of valid material. Students learn about their birthstones as well as the mineral industry through online research, writing, and development of an electronic presentation.

Activities

PREPARATION

- ▷ Develop a timeline to keep track of deadlines.
- ▷ Distribute a traditional calendar to students and parents with all project deadlines clearly noted. All students cross-reference their research assignments and deadlines in their student planners.
- ▷ Create a "traveling folder" for students to hold their reports as they carry them from class to class. (This simple device cuts down on the "I lost my paper" excuse.)
- ▷ At the project's midway point, notify parents a second time via computerized phone call, e-mail, or message on the homework hotline.

SCIENCE CLASS PROCEDURE	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
① Have books, charts, and periodicals available in the science classroom. Research begins as students discover and identify their birthstones. Internet research is combined with traditional materials in studying the stones within the context of the earth sciences.	ELA 1, 8	7
② If possible, create a phony site with misinformation. Point students in its direction, with the teaching objective that they learn to question and challenge the information they gather and its source.	ELA 11	10
③ Students fill in their research outline for an essay to be written later. As part of the research phase, emphasize taking notes for a bibliography.	ELA 5, 6, 8	
ENGLISH LANGUAGE ARTS PROCEDURE		
① Students write a narrative essay titled "Circumstances of My Birth." This autobiographical piece requires students to do some basic research, and its purpose is to generate interest in and enhance the success of the research writing task. This piece will act as a prologue, in each student's own voice, to the formal research paper and is particularly effective when recorded in the	ELA 4, 5, 8	8

writer's voice as part of a multimedia presentation. Students write the first drafts of their introductions in class, stressing their personal connections to their birthstones. Following the research outline helps students learn the basic report format.

TECHNOLOGY INTEGRATION PROCEDURE

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
① Students word process their handwritten research outlines.	ELA 5	8
② Students continue to use search engines on the Internet to locate gemstone Web sites. They develop a file of scanned or downloaded birthstone images, and find short computer animations of birthstone formation. At this point, introduce and explain the concepts of copyright and intellectual property. Students can use a digital camera to produce original graphics. These resources are saved for use in students' multimedia presentations.	ELA 8, 11 IL 3	7, 8, 10
③ Using word-processing software, students create their first paragraphs by expanding their outlines. Voice-rich material, handwritten in English class, is added. Students use this basic procedure to develop all essays over approximately two weeks.	ELA 5, 8 IL 3	5
④ Once students have completed all their paragraphs, they assemble them into a formally formatted report (bound on the left). Teach advanced word-processing skills so that students can develop title pages, table of contents, page numbering, and bibliographical information.	ELA 5, 8	5
⑤ After completing their reports, students begin their multimedia stacks. Use a rubric with performance expectations. Students design, animate, and test cards that present significant research text. Require that students do a bibliography card.	ELA 7,12	
⑥ After completing the multimedia stack, students produce a Web page that includes text from the formal report, links to the stacks, and an interactive "Webliography" of sites with pertinent gemstone information. Students also create a cross-reference to other student-created sites for the same birthstone.	ELA 7,12	4
⑦ Organize a technology night for students to demonstrate and explain their presentations. Self-evaluation techniques that stress connections to NETS for Students and student performance can be shared and promoted.	ELA 4, 6, 8, 11, 12	2

SCIENCE AND TECHNOLOGY PROCEDURE

① Conduct a mineral lab to let students gather firsthand data about birthstones. Students analyze the results of the mineral lab and compare their results using a database. Information from the mineral lab is used in the second draft in the appropriate sections of the research reports.	ELA 8	
② The final deadline for typed research outlines is reached after approximately two weeks. Students submit their research outlines, which include endnotes and a bibliography. Outlines are reviewed by the teaching team and scored in science class for accuracy and completeness.	ELA 10	

Tools and Resources

SOFTWARE:

- Word-processing, database, presentation, Web page creation

WEB SITE:

Kingsbury Middle School (student samples):
http://kmsweb.slinternet.com/

OTHER:

- Research outlines, rubrics, print research materials, materials to perform mineral scratch tests

Assessment

Develop grading rubrics in science, English, and technology that reflect each discipline's emphasis. Distribute and explain these rubrics in all classes. For the revision of the first typed draft, emphasize sentence fluency, mechanics, and personal voice.

Using the same rubrics supplied to students, have each team member read and assess a final word-processed draft of each research paper.

Credits

Dennis O'Connor (do_connor@educator.mci.com), Phil Sorensen, and Barbara Lothian, Kingsbury Middle School, Douglas County, Nevada

Comments

Most reports gather dust once they have been turned in and graded. The Birthstone Project just keeps building. Word-processed files and computer graphics are now used in a HyperStudio-based multimedia production. Students are taught the programming basics of HyperStudio, learn how to save their word-processing files to a text format, and learn how to import graphics from other programs and the Internet. Students also create HyperStudio stacks. Once again, rubrics are used to help students understand grading criteria.

As we looked at how we wanted to assess students' work and provide feedback, we decided to write comments in separate colors to distinguish our remarks. Each class counted the assignment as a major term paper. We returned papers and grading rubrics to students. (A major goal for this year's rotation is to streamline and simplify our grading.)

The completed stacks are shared with the community at a school board meeting. Birthstone multimedia presentations also became the centerpiece of a back-to-school night in the technology lab. The level of excitement generated by going from the traditional report to a multimedia production is extraordinary. Many of the students we "lost" during the more traditional phase of the project were willing to make up their missed work so that they could participate in the multimedia project. The entire teaching team is invigorated and enthused by the interdisciplinary process. Student motivation is very high. All teaching team members, while exhausted, feel renewed.

Creating a Heroic Character

English Language Arts

Middle Grades 6–8

Purpose

Students will use spoken, written, and visual language to communicate effectively with a variety of audiences. Technological resources will be used to display and represent the characters students create.

Description

Note: This lesson sequence is another way to look at heroes in the Grades 3-5 "Wall of Fame" activity. This activity can be used alone or as a follow-up to that activity.

Students answer a series of defining questions that lead them to develop a fully realized heroic character. Guided imagery that emphasizes sensory impression is used to fully define the character of the hero. Students create a variety of multimedia representations of their hero, including video interviews, HyperStudio stacks, Web pages, and digital art. By selecting appropriate materials and resources, teachers can adapt this learning activity for students whose first language is not English.

Activities

PREPARATION

- ▷ Arrange to use a digital camera or scanner.
- ▷ Reserve school computing facilities and enlist technology personnel and/or volunteers to help students during video production, HyperStudio use, Web page creation, and digital photo manipulation.

PROCEDURE	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
① Organize students into collaborative teams and have them search the Internet for examples of heroic men and women from different times and cultures (see Tools and Resources). Have groups organize their heroes in ways that make sense.	ELA 1, 7, 8, 9 IL 1, 2, 9	4, 7
② Students identify their personal heroes and describe their heroic traits. Discuss the broad categories of heroes, perhaps: superheroes, local heroes, helping heroes, and so on. Use these categories as students create a database to classify and sort data.	ELA 7, 12	5, 8
③ Identify five specific character traits and the physical behavior or actions that make up those traits. Identify real heroes who have the qualities of character the students are researching. Locating local heroes may allow students to conduct one-on-one interviews while other living heroes may be available for e-mail interviews or idea exchanges. Digital images of heroes can be collected and a hero art gallery assembled.	ELA 7, 8, 9	5, 6, 7

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6-8
④ Spend time processing and organizing information gathered thus far by using webbing or concept-mapping software, such as Inspiration® or Expression.	ELA 5, 8	4
⑤ Students brainstorm questions they would like to ask their heroes. These questions will later be refined, sifted, and used as defining questions for students to answer as they create their fictional heroes.	ELA 5, 7, 8, 12 IL 9	
⑥ Students collaborate with each other, another adult, or both, to develop a list of questions that will help them define a heroic character. Students can generate this list of questions as part of their preparation and research in heroic character traits. Sample directions might include:	ELA 5, 7 IL 2, 9	6
▷ Name your hero (first, middle, last name).		
▷ Decide on a specific date and place for your hero's birth. (By specifying a particular era or location, students can work with a variety of multicultural themes.)		
▷ Describe the circumstances of your hero's birth.		
▷ What is a core value of your character?		
▷ Is your character religious or spiritual?		
▷ What is your character's highest level of education?		
▷ Describe some treasured memorabilia your character possesses.		
▷ Recall a traumatic event from your hero's early childhood and tell what happened.		
▷ Envision then describe your hero making something with his or her hands.		
▷ What is your hero's favorite music?		
▷ Does your hero play a musical instrument? If so, how well?		
⑦ As students answer the series of defining questions, use guided imagery at appropriate points to complete the prewriting process and charge students' imaginations. At every opportunity, use detailed images. These questions are springboards for writing sessions that emphasize the use of showing detail in writing. Answer two or three questions each day, for several weeks. Students find images that detail and describe their answers as an extension of the daily writing assignments.	ELA 5 IL 1, 3	5
⑧ Once the character has been defined through the question and answer process, many language arts activities can be implemented with the goal of using them as part of a multimedia presentation. Students can:	ELA 6, 7, 8, 11	
▷ Conduct a survey of classmates and teachers asking the question: What is a hero? Categorize and post survey results. Complete similar surveys with friends of a keypal class.	ELA 5, 12	4, 5
▷ Keep a daily journal of the activities of the chosen character, by the character, using conventional word-processing software or products.	ELA 4, 5, 6, 12	5

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
▷ Create and present an interior monologue in which the character wrestles with a moral dilemma.	ELA 5	5
▷ Create a dialogue between the character and the most important person—teacher, mentor, friend, guide, and so on—in his or her life.		
▷ Create a cartoon strip, comic book, or video storyboard about a defining moment in a character's past.	ELA 5	5, 6, 7
▷ Create a song or musical composition for the hero, or find music with lyrics that support one of the character's central values.	ELA 5	6, 7, 8
▷ Write a poem from the point of view of a character.	ELA 5, 6	5
▷ Write a diamente poem about the character's traits.	ELA 5, 6	6
▷ Create animated stories using an animation program.	ELA 4, 5, 6	6, 7, 8
▷ Review the answers to the defining questions and write a brief narrative story.		5, 6, 8
▷ Create a coat of arms, family clan symbol, or a personal representation that symbolizes their hero's character traits.	ELA 8	6, 7, 8
▷ Search news media for situations that need their hero. Introduce their hero to that situation. Hold a press conference so that their hero can answer questions on how he or she resolved the situation.	ELA 1	8, 10
▷ Answer the questions: If you could have called on your hero at one point in your life, how would he or she have helped you?	ELA 1	5
⑨ Once a body of work has been produced that fully defines the character, multimedia can be used to present the heroic figure in different ways.		
▷ Using a digital camera or scanner, students find images of their idealized heroes and convert them to digital form.	ELA 5, 8, 12	5, 6
▷ Using painting or graphics software, students work with the images to make them specific to their heroes.		5
▷ Students can be encouraged to use software to change their own portraits—that is, morph their own images into pictures of their heroes.		6
▷ Students collaborate to create video interviews about their heroes. Students form teams to create on-camera interviews that stress the heroic traits that were researched earlier in the project. Videos can be displayed in a stand-alone manner, used as part of multimedia stacks, or captured as video clips for display on a Web site.	ELA 7, 8	4, 6
▷ Students create a multimedia stack with an illustrated page that shows the best of the defining answers.	ELA 7, 8	4, 6

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
▷ Students search the Internet for images of items associated with the hero and create an interactive image gallery. For example, each student will have answered a defining question about his or her hero in which they visualize the hero picking through a treasure chest of memorabilia. Each item is symbolic of a significant event in the hero's life. Multimedia stacks can be used to assemble appropriate images that are hot-linked to appropriate writing or art projects.	ELA 7, 8	6, 8
▷ Students assemble a home page of heroes to present the class's work. Each student's page can present the universe in which his or her hero lives as well as the student's original answers to the defining questions, heroic trait research, important Web sites, images, other resources gathered during the early phases of the unit, and links to multimedia presentations.	ELA 8, 12	5, 6, 7

Tools and Resources

SOFTWARE:

- Presentation (e.g., HyperStudio), word-processing, Web page creation, digital art

HARDWARE:

- Digital camera, video camcorder

WEB SITES:

Characters of Greek Mythology:
www.geocities.com/Athens/Oracle/5545/

Local Hero Project:
www.mbnet.mb.ca/~stonymtn/localhero.html
(Stony Mountain Elementary School, Manitoba, Canada)

Guided Visualizations:
www.connections.net/cc/ndevons/special/creatvis.htm

Heroes—Literature and Life:
www.cwrl.utexas.edu/~roberts/e316_fall95/student_projects/group3/index.html

Heroes in Literature—Romantic, Adventure, Religious, and Political:
www.cwrl.utexas.edu/~roberts/e316_fall95/student_projects/group3/heroe.html
(includes an online survey)

An Exercise in Creative Visualization:
www.geocities.com/Athens/4551/exvis.htm

BOOK:

- Jacobs, H.H. (1997). *Mapping the big picture.* Alexandria, VA: Association for Supervision and Curriculum Development.

Assessment

Design rubrics that will promote the use of detail when students answer the defining questions.

Create rubrics that detail specific requirements for the multimedia presentation (e.g., a five-page stack, representing five traits, with at least one animation and one sound recording for a grade of X.)

Credits

Dennis O'Connor, Kingsbury Middle School, Douglas County, Nevada (do_connor@educator.mci.net)

Carla Fenner, New Mexico School for the Deaf, Santa Fe, New Mexico (cfen@nmsd.k12.nm.us)

Comments

Guided visualization may seem odd as a technique to use before students begin to write, but it became one of the most exciting and enjoyable activities in this unit. As teachers, we looked for questions that students needed to ponder, and we always urged students to elaborate on their answers by showing details. Typically, we'd start each visualization session the same way, believing that all students would eventually become trained to the pattern. Lowering the lights, playing soothing music, and using temple chimes all served as focus devices and were part of the routine. Anyone who has lowered the lights in a middle school classroom knows that training is needed to get the students to focus. Students were reminded that talking, making noise, laughing, and so on were arrogant and selfish acts that said to the group that the offender's ideas were more important than anyone else's thoughts. We cast the offender as a snob acting as if he or she were better than the rest of the students. This peer-pressure tactic helped control those middle school impulses!

Discovering Ourselves in Literature and Life

English Language Arts

Secondary Grades 9–12

Purpose

Students will:

- Read a wide range of print and nonprint texts to build an understanding of texts, themselves, the United States, and other cultures
- Read a wide range of literature in many genres to build an understanding of the human experience
- Apply knowledge of language structure, language conventions, media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts

Description

Students read literature (fiction, nonfiction, poetry, drama) and view creations in other media to discover how print and nonprint texts answer the thematic question: "Who am I?" Students analyze print and nonprint texts and compare the ways in which ideas are presented in different media. Students create their own multimedia portfolios and personal Web pages that reflect who they are.

Activities	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
① Students draw outlines of their bodies on paper or images of themselves in electronic format. On the insides of their outlines, students write words and phrases that describe their personal characteristics, emotions, ideas, values, beliefs, and goals—things that may not be readily apparent to other people. On the outside of their outlines, students write the words and phrases that reflect how they think other people see them (physical features, external behaviors, voice).	ELA 12	2, 7
② In electronic journals, students reflect on questions such as: ▷ Do you see any patterns in the words? ▷ Does anything surprise you? ▷ If you were to share your descriptions with someone else, with whom would you share them? ▷ What do you think their descriptions might be and why? ▷ What did you learn about yourself?	ELA 4	5
③ Students scan photos of themselves or take photos of themselves with a digital camera. Students discuss the following questions: ▷ How would you create a self-portrait?	ELA 4, 11, 12	8

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9-12
▷ If you were to capture yourself in either photography or fine art, what would you want to communicate to viewers?		
▷ Are these characteristics from the inside or the outside of your outline?		
④ Introduce students to the self-portraits of painters, photographers, and filmmakers. Students collect additional examples from online resources. Students analyze how these people framed themselves, used camera angles and points of view, created context through background and other objects, and used color, design, and texture. Students describe in their electronic journals how these visual images answer the question: "Who am I?"	ELA 6	7
⑤ Students begin to create their own multimedia self-portraits using words, phrases, photos, and other visual images. This is the first stage of constructing their own individual Web page. Students select the appropriate technological tools for assembling, synthesizing, and displaying multimedia materials, and they discuss the ethical implications of publishing on the Web.	ELA 4, 6, 8, 12	1, 2, 4, 8, 10
⑥ Students read literary selections including memoirs, dramas, autobiographies, poetry, essays, and novels (see suggested writers in Tools and Resources). Students search the Internet to find related information about the authors and works and create an electronic bibliography.	ELA 1, 2, 3	7
⑦ Students analyze how different writers convey meaning through language, literary devices, and genre. In electronic versions of texts (when available), students use automated search tools to locate and analyze language and patterns.	ELA 3, 6, 9	8
⑧ Teams of students use presentation software to share how they think the characters or narrators in these works answered the thematic question: "Who am I?" Students discuss how gender and cultural perspectives influence how the individuals understand themselves. Students discuss how different writers convey meaning through language, literary devices, and genre.	ELA 3, 6, 9	2, 8
⑨ In their journals, students record and respond to passages from literature that explore the theme: "Who am I?" Students share their responses in print or electronic formats (e.g., e-mail and online bulletin boards) and discuss the relative merits of using different communications media.	ELA 6, 11, 12	1, 2, 3, 5, 10
⑩ In collaborative groups, students select thematic passages from literature and create a film script (the visual and auditory images of what people would see and hear in a movie). Using electronic display tools, students share how sight and sound are combined to create an effect on an audience. Students discuss how different directors might use different techniques to represent the text in film. Students examine how the gender and culture of the characters or narrators affects the answer to the question: "Who am I?"	ELA 1, 3, 6, 9	2, 5
⑪ Students view a film related to the theme: "Who am I?" They analyze how setting, dialogue, camera angle, music, lighting, and other film elements create mood and convey the theme. Students compare the film to their own film scripts and other print and nonprint texts.	ELA 6	

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
⑫ To create their own Web pages, students gather multimedia resources from their portfolios, make connections among the components, and represent the relationships in hypertext. Components of Web pages include passages from literature, excerpts from film and fine art, personal writing and art, including self-portraits, and music and other recordings such as their own or others' oral readings. Students should keep in mind the audiences for their Web pages.	ELA 4, 5, 6, 7, 8, 11, 12	2, 5, 7, 8, 10
⑬ In their electronic portfolios, students reflect in writing on what they have learned about themselves from this project and how the use of technology has affected the processes of learning and sharing.	ELA 1, 4, 11, 12	1, 3, 4, 6

Tools and Resources

SOFTWARE:

- Word-processing image-manipulating, Web page creation

HARDWARE:

- Video camcorder, digital camera, scanner

WEB SITES:

Amy Tan:
www.indiana.edu/~eric_rec/ieo/bibs/amytan.html

Sandra Cisneros:
http://falcon.jmu.edu/~ramseyil/cisneros.htm

Robert Cormier:
www.carr.lib.md.us/mae/corm-web.htm

Gary Paulsen:
www.indiana.edu/~eric_rec/ieo/bibs/paulsen.html

Cynthia Voigt:
www.bhs.edu/wmc/521fl98/kaa/cvhp.html

Maya Angelou:
http://falcon.jmu.edu/~ramseyil/angelou.htm

Suzanne Fisher Staples:
www.indiana.edu/~eric_rec/ieo/bibs/staples.html

Laurence Yep:
http://falcon.jmu.edu/schoollibrary/yep.htm

S. E. Hinton:
http://lavender.fortunecity.com/brasco/65/out/outlinks.html

Sherman Alexie:
www.fallsapart.com/

Gary Soto:
www.sdcoe.k12.ca.us/SCORE/soto/sototg.html

BOOKS (AND VIDEOS):

The House on Mango Street by Sandra Cisneros
The Joy Luck Club by Amy Tan
Chocolate War by Robert Cormier
The Island by Gary Paulsen
Dogsong by Gary Paulsen
Dicey's Song by Cynthia Voigt
The Catcher in the Rye by J.D. Salinger
Going Home by Nicholasa Mohr
And Still I Rise: Poems by Maya Angelou
The Road Not Taken by Robert Frost
Shabanu: Daughter of the Wind by Suzanne Fisher Staples
The Lost Garden by Laurence Yep
The Outsiders by S.E. Hinton (movie version also)
The Diary of Anne Frank by Anne Frank (dramatic and movie versions also)
Breaking Away (movie)
The Lone Ranger and Tonto Fist Fight in Heaven by Sherman Alexie (also movie version, *Smoke Signals*)
When the Legends Die by Hal Borland (movie version also)
Living Up the Street: Narrative Recollections by Gary Soto
Borderlands/LA Frontera: The New Mestiza by Gloria Anzaldua
Silent Dancing: A Partial Remembrance of a Puerto Rican Childhood by Judith Ortiz Cofer
I'm Nobody by Emily Dickenson
Ceremony by Leslie Silko

Assessment

Students develop a rubric for evaluating individual Web pages.

Students assess the strengths and weaknesses of their own and others' Web pages.

In their portfolios, students reflect on both what they learned and their learning strategies.

In their presentations, students demonstrate their growth in spoken, written, and visual language and their understanding of the thematic question: "Who am I?"

Students share their decision-making processes in conferences with the teacher.

Students invite audience responses to their Web pages.

Credits

Beverly Ann Chin, Department of English, University of Montana, Missoula, Montana (bchin@selway.umt.edu)

Comments

We have found that this unit has broad appeal for high school students who are often struggling with issues of who they are in relation to their peers, society, and the world. The literary selections in this lesson enable students to see how others have struggled with the same issues while the activities provide them with a structure for exploring their own thoughts and feelings. We have found that multicultural issues are a natural extension of this topic. Using the technology has provided interesting and creative ways for students to express themselves in forms that allow even the most introverted and shy to shine.

What Makes the Writer Write?

English Language Arts

Secondary Grades 9–12

Purpose

Students study Charles Dickens's *Great Expectations* to gain insight into a classical piece of fiction and to understand how writers respond to social conditions. Students also consider how that response is important today.

Description

In a high school literature unit, students study Dickens's *Great Expectations*. The unit asks students to:

- ▷ Study Dickens, how he wrote, and what motivated his writing
- ▷ Research and report on the social context of Victorian society
- ▷ Examine how literature translates into film
- ▷ Respond to literature and other students' critiques by e-mail
- ▷ Read the works of contemporary writers who address social conditions
- ▷ Identify problems in contemporary society and respond to them

By selecting appropriate materials and resources, teachers can adapt this learning activity for students whose first language is not English.

Activities

COLLABORATIVE RESEARCH

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9-12
① Groups of students, working collaboratively, research Dickens: his life, his concerns, his style and use of figurative language, his plot construction, his work as a publisher, and his experiences as a reformer. Students also study works of Dickens that have been made into films or adapted for theater.	ELA 1, 3, 7, 8 IL 1, 2, 3, 8	1, 2
② Other collaborative groups research the social context of the Victorian period: women's rights, education, the prison system, and social classes. Students scan appropriate images from print sources, accurately citing those sources in their own works; download information from the Web as they share their research by e-mail; and gather the materials they need to build presentations.	ELA 5, 7, 8, 11	
③ Students use new media as well as printed publications to conduct this research. To help students cope with the shifting problems of research, raise questions such as: Where can I find resources? How do I search? What evaluative criteria are appropriate when a Web search produces thousands of Web pages?	ELA 7, 8, 11, 12	

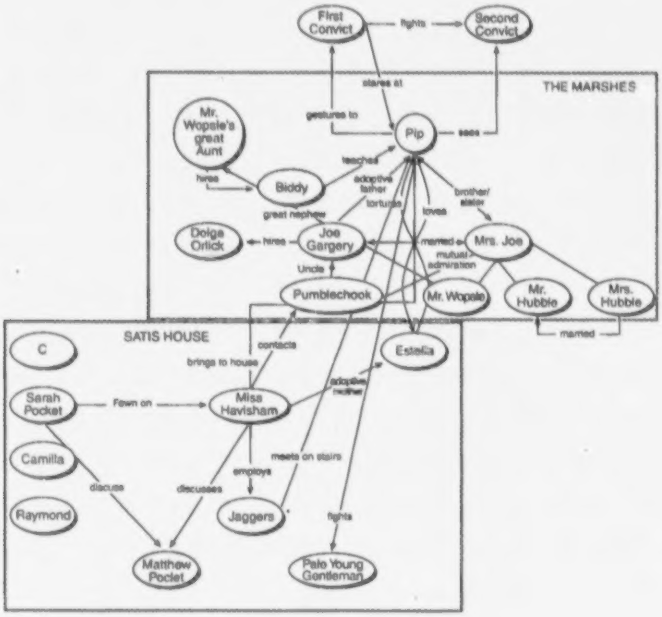
	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
④ Each group of students prepares a multimedia presentation for the class. As students read the novel, presentations are held at appropriate points. For example, students researching the prison system make their presentation early on, when Dickens portrays the first convict as a dehumanized animal. The teacher and class evaluate presentations using a mutually devised rubric, combining measures for depth and breadth of content as well as quality of presentation. The follow-through on this part of the unit includes a class discussion on the capabilities and limitations of technology.	ELA 2, 4, 5, 6, 8, 11, 12 IL 5, 6, 7	5

MEDIA STUDY

For a film study of *Great Expectations*, use videotapes or digital versions (e.g., DVD, laserdisc) of David Lean's 1946 version, the BBC series, or other versions. Digital copies and multimedia-authoring software, such as HyperStudio, make it easier for students to explore how different filmmakers establish character. (Compare, for example, Dickens's verbal description of Miss Havisham, Lean's gradual revelation, and the Disney version. Play the video and discuss analogies between verbal and visual language.) Other areas that lend themselves to this type of examination are (1) setting, (2) emotional tone, and (3) mood (atmosphere). Perform a Web search on *Great Expectations* through www.hotbot.com/. Movie-related sites, although not long-lasting, have considerable detail and comparative information.	ELA 1, 4, 6, 8, 11, 12	8

CLASS DISCUSSION

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
① Help the class develop several threads of discussion based on different aspects of the novel, including social issues that emerge. Extend the class discussion through e-mail interchanges broadcast to the entire class as well as through a few online, electronic class meetings. Occasionally examine printouts of these exchanges to monitor student participation and class progress.	ELA 4, 5, 8, 11	5, 7
② At crucial points in the reading, students discuss the relationships that emerge among the characters. Before these discussions, present a visual representation of the relationship. Students create and compare their own visual representations. (See the following example.)	ELA 1, 3, 11	9


First Convict
fights
Second Convict
THE MARSHES
stares at
gestures to
Pip
sees
Mr. Wopsle's great Aunt
teaches
hires
Biddy
adoptive father
brother/sister
tortures
loves
great nephew
Dolge Orlick
hires
Joe Gargery
married
Mrs. Joe
mutual admiration
Uncle
Pumblechook
Mr. Wopsle
Mr. Hubble
Mrs. Hubble
married
SATIS HOUSE
C
contacts
brings to house
Estella
adoptive mother
Sarah Pocket
Fawn on
Miss Havisham
Camilla
meets on stairs
employs
discuss
discusses
Raymond
Jaggers
fights
Matthew Pocket
Pale Young Gentleman

Example: *Great Expectations web* (created using Inspiration® software)

	ENGLISH LANGUAGE ARTS STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9-12
③ The class discusses the ways in which Dickens appears to have perceived and been affected by various social conditions. Before this discussion, make a web of ideas—an expert system, so to speak. At the close of the discussion, each student compares his or her web with the class's web.	ELA 2, 5, 11, 12	3, 9
④ The class shows how the events in *Great Expectations* could happen today. (Consider the setting of Third World countries.) Students create their version using video clips and images from the Internet. The project objective is to justify why the chosen setting and circumstances are parallel to the original story.	ELA 2, 5, 11	3, 9

CRITIQUE OF SOCIETY

① Follow-through includes students' examination of the same issues in contemporary society. Based on what they know about Dickens from their research and the opportunities he had for expression, students start their speculation by asking: "How would Dickens react to this today?"	ELA 11, 12 IL 9	
② The class brainstorms social conditions that mirror those of Dickens's time: social class, diversity, the penal system, and education. Students speculate on the questions: How would Dickens react to today's problems? What choices would Dickens make today?	ELA 2, 11	
③ Working individually or in groups, students choose a problem to focus on and a way to respond. For example, one student writes and publishes fiction based on an issue of prejudice; another student uses a photographic essay to document local social conditions that lead to crime; another creates a Web page that links sites that promote activism on a specific rights issue. One group mirrors Dickens's methods and arranges to learn more about the local police by taking a citizen awareness course, going on the beat with a police officer, and presenting the experience to the class in a multimedia log. Another group of students produces a video documentary on issues of social class. Assessment for this part of the unit is based largely on the reaction of a larger audience.	ELA 5, 6, 8, 11, 12 IL 5	4, 5, 10

A STUDY OF TODAY'S AUTHORS

Students' outside reading should concentrate on contemporary writers who are responding to social issues, for example: Aleksandr I. Solzhenitsyn's *The Gulag Archipelago*, John Grisham's *The Chamber*, or Stephen King's *The Shawshank Redemption*. Students collaborate on a class timeline (posted on a classroom bulletin board or a class Web site), placing younger authors on a timeline with Dickens. Posting student notes about contemporary social conditions helps students grasp each author's relationship to Dickens.	ELA 1, 2, 4, 5 IL 5, 6, 7	

Tools and Resources

SOFTWARE:

▷ Word-processing, presentation, multimedia-authoring

HARDWARE:

▷ VCR, laserdisc, or DVD player

WEB SITES:

The Discovery Channel's Great Expectations:
http://discoveryschool.com/spring98/programs/greatbooks-greatexpectations/index.html
(David Lean, Great Expectations, The Criterion Collection.)

The Dickens Project:
http://humwww.ucsc.edu/dickens/other.online.resources.html
(contains links to many useful sites for studying Dickens and the Victorians)

Charles Dickens (bibliography of Dickens-related information):
www.bibliomania.com/Fiction/dickens/

Assessment

Students develop a rubric for evaluating presentations. Consider audience response to each presentation.

Hold conferences with students and keep a record of class participation.

Compare with students the iterations of student-developed concept maps.

Credits

Werner Leipolt, Coleytown Middle School, Westport, Connecticut
(wleipolt@ilt.columbia.edu)

Comments

This activity combines elements from many teachers' classrooms as well as my own experience. Kate Breen of Louisville, Kentucky, has pioneered research into weaving Victorian social research into the teaching of Dickens's novels. Many ideas here have grown from the summer 1997 National Endowment for the Humanities seminar "Serial Production: Dickens Bleak House" held at the University of California–Santa Cruz.

Notes:

Foreign Language Learning Activities

▷ Introduction

▷ PreK–2 Abuelita y Yo: Just Grandma and Me

▷ 3–5 Les Voyageurs: The Explorers

▷ 6–8 Keypals

▷ 9–12 Servus in Öesterreich: Welcome to Austria

INTRODUCTION

Foreign Language Learning Activities

Standards for Foreign Language Learning: Preparing for the 21st Century (1996), opens with a statement that is expanded here to articulate how technology facilitates meeting the foreign language standards.

> *Competence in more than one language and culture enables people to communicate with other people in other cultures in a variety of settings [and to] participate more fully in the global community and marketplace. Activities that are technologically supported by oral and written exchanges enable students to look beyond their customary borders [and] gain direct access to additional bodies of knowledge, which the Internet encourages.*
>
> *All students can be successful language and culture learners, and they ... learn in a variety of ways and settings, and acquire proficiency at varied rates. Technology allows for high degrees of individualized learning so that students can control their practice and access materials of particular interest to them. Language and culture education is part of the core curriculum, and it is tied to program models that incorporate effective strategies, assessment procedures, and technologies. (p. 7)*

Technology enables students in world language classes to use language to communicate, conduct research, and connect across cultures in ways that previous generations could not imagine. Most of the activities that follow could not take place without technology as a delivery system to promote access and immediacy of response. With the click of a mouse, students can exchange ideas with native speakers and learn how other cultures view events.

The developers of the foreign language standards were able to recommend with confidence activities that focus on the "Five C's"—communication, cultures, connections, comparisons, and communities; technology is the vehicle that makes such learning possible. Today's students communicate instantly through e-mail and receive prompt feedback on how well their messages are understood. They need not wait for a penpal's letter to cross an ocean or for the occasional international student to visit their classroom. Elementary school children create Web pages to present themselves internationally and find peers with whom they are able to "chat." Technology-based learning provides instruction in languages that are otherwise inaccessible, and students are able to pursue language study at advanced levels even in schools that cannot provide teachers for these courses. Cyberspace makes people who speak languages other than English more accessible—and certainly less "foreign."

PREVIEW OF LEARNING ACTIVITIES

The following activities demonstrate how language learning can be enhanced and enriched at all grade levels by infusing technology into the learning process. Students engage in activities that meet the national foreign language standards as well as the ISTE National Educational Technology Standards for Students.

At the primary level, students use spoken, written, and visual language to communicate within the context of a story. *Abuelita y Yo* (Just Grandma and Me), the interactive book on CD-ROM by Mercer Mayer, encourages students to use technology to gain information about the story's setting, to analyze and interpret information, and to make generalizations about what they have read. The ecosystems illustrated in the text are expanded with activities correlated to the natural habitats and geography typically studied in science and social studies classes.

Using a variety of media and technological resources to collect, analyze, and communicate information, students in Grades 3–5 use French in the learning activity "Les Voyageurs: The Explorers" to connect to social studies. Students reinforce their knowledge of the geography of North America and mapping, in French, using computer software to trace explorers' travels. The Internet helps students develop their understanding of early fur traders and Native American peoples. The culminating activity is a reenactment program for other classes, parents, or both.

Middle school students become keypals or "ambassadors" by using a variety of technological resources to communicate in a foreign language with students of other cultures. During a year-long exchange, students have a truly international experience while working together on projects of common interest, using the Internet, creating Web pages, and visiting Web sites. The content of the lesson is generic, making it adaptable to all languages and levels of language learning.

"Servus in Österreich: Welcome to Austria" is designed to involve students in constructivist learning activities using the Internet, Web-based activities, and multimedia. Using German, students learn about the practices and products of the Austrian culture. They communicate about cultural differences and draw comparisons between their own lives and the lives of typical Austrian citizens. At the conclusion of the activity, students participate in a video interview with the teacher, demonstrating their level of language competency as well as their use of technology.

These learning activities provide ideas and suggestions that may expand on lessons that teachers are already using. Be sure to consult other sections of this book for integrating the learning of languages into other curriculum areas. Many strategies and topics that are relevant to the foreign language classroom will be found there.

Abuelita y Yo: Just Grandma and Me

Foreign Language (Spanish)

Primary Grades PreK–2

Purpose

Students use the spoken, written, and visual Spanish language to communicate within the context of a story. The example used here is *Abuelita y Yo* (Just Grandma and Me) by Mercer Mayer. Using an interactive book, students use technology to gain information about the setting, and analyze and draw conclusions about the story and its characters.

Description

This learning activity uses an interactive book, Abuelita y Yo (Just Grandma and Me), to practice Spanish. Students listen and read the book as they make object identifications in the target language. Ecosystems illustrated in the text are expanded with activities that correlate to natural habitats and geography that students typically study in science and social studies. Through the interactive book, students interpret and convey ideas, making generalizations about what they have read.

Activities

PREPARATION

- ▷ Introduce the author, Mercer Mayer, using the interactive book, Abuelita y Yo. Prepare students with useful phrases in the context of the story. Concentrate on vocabulary that meets students' needs.
- ▷ Create sequencing cards that contain portions of the plot.
- ▷ Create comprehension questions in the target language and English (if necessary) based on experiences described in the book.
- ▷ Identify ecosystems of the ocean and meadow as presented in the text. Include plants, animals, insects, and so on. Focus on developmentally appropriate scientific language that accurately describes the setting.

PROCEDURE	FOREIGN LANGUAGE STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK–2
① In a class setting, present Abuelita y Yo. Identify and interpret the plot and characters. Be sure to click all the activity characters and objects as you progress through the story. Provide an opportunity for students to experience the story individually or in small groups.	FL 1.2, 1.3, 3.1, 5.2	1, 3, 4
② Have students order the sequence cards to practice retelling the story. Have students check by revisiting the story.	FL 1.3	
③ Ask and respond to oral comprehension questions in the target language, including answers that express opinions, likes, and dislikes.	FL 1.1, 1.2, 1.3	
④ Create a visual representation that summarizes the students' favorite parts of the story. It may be appropriate for the teacher to do some scripting or guided writing in the target language to accompany the visual representation.	FL 2, 4, 5	1, 3, 4

	FOREIGN LANGUAGE STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK-2
⑤ Categorize the flora and fauna found in ecosystems of the ocean and meadow in a language immersion context.	FL 1.2	2, 4, 5
⑥ Diagram similarities and differences in flora and fauna found in a local city (e.g., Lincoln, Nebraska) and a seaside city in a place such as Puerto Rico.	FL 3.1, 5.1	2, 3, 5
⑦ Culminate the lesson sequence by having students create a trip to the beach with a relative. They should describe orally or in writing all the things they see and do. Share these stories with others electronically, through video, or by live telecast.		

Tools and Resources

SOFTWARE:

▷ CD-ROM Abuelita y Yo (Just Grandma and Me), Living Books (Brøderbund)

OTHER:

▷ Library references for print materials (*Note:* Many interactive books can substitute for Abuelita y Yo); teacher-made manipulatives, including sequence cards, Venn diagrams for ecosystem study, and ecosystem manipulatives; art supplies for visual summaries

Assessment

Evaluation measures include oral, written, and visual responses provided by the student. Within a context, the student responds, conveying information about the text. Visual Venn diagrams and small group work with manipulative sequence cards can also be used.

Credits

Nila Jacobson, Everett Elementary, Lincoln, Nebraska

Comments

We have used this unit as a component of content-based instruction for first grade. We have found that as language educators, we are constantly supporting the core curriculum through practice in oral and written expression. The use of Abuelita y Yo in Nebraska, a location quite far from any beach, provided a wonderful avenue to discuss beach trips, both real and imagined. The topic of the geographic location of Nebraska, in reference to the closest ocean, obviously became quite a discussion.

Notes:

Les Voyageurs: The Explorers

Foreign Language (French)

Intermediate Grades 3–5

Purpose

The purpose of this learning activity is for students to:

- Use French to learn about the *voyageurs*
- Reinforce their knowledge of the geography of North America and mapping
- Compare Native American and French-Canadian food, customs, and clothing
- Perform a reenactment of the *voyageurs'* lives
- Use a variety of media and technological sources to collect, analyze, and communicate information
- Collaborate with classmates to put on a performance

Description

In this unit, students connect French to social studies by learning about the early fur traders and Native American peoples. They reinforce their mapping and geography skills and replicate products of the period, such as *tuques* (the period headwear) and soup. Students share their knowledge through performing a reenactment of a typical day or event in the life of a *voyageur* and produce a printed program guide with graphics. They use computer software to draw the itinerary of the *voyageurs* and produce a *voyageur's* imaginary diary with pictures.

Activities

PREPARATION

- Obtain materials in French about the *voyageurs*.
- Obtain the appropriate costume and rehearse playing the role of a *voyageur* for presenting information.
- Research songs and dances from the *voyageur* period for presentation to the class.
- Make the necessary arrangements for space and reserve a date on the school calendar. Think ahead about how the program would logically be organized (e.g., learning about the canoe, paddling, portaging, resting, singing, eating pea soup, trading with Native Americans, and dancing at a rendezvous).

PROCEDURE

	FOREIGN LANGUAGE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
① Present initial information describing the clothing, activities, and daily life of the *voyageurs*. Students describe the animals of the fur trade and learn to bargain in French. Use the internet and Web pages for research. Working in teams or alone, students compare the information they gather and store it in a database.	FL 1.1	1, 6, 7

	FOREIGN LANGUAGE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3-5
② Introduce vocabulary that is used to describe how the *voyageurs* lived and worked. Focus on student comprehension of information. Students respond to commands given in French, dramatizing the *voyageurs'* lives and making tuques. Students make entries in word-processed diaries as the *voyageurs* continue their adventures and add fresh entries as new aspects of life are introduced.	FL 1.2	1, 4, 5
③ Increase comprehension by dramatizing the life and culture of French-speaking residents of the New World at the time of the fur trade. Send students on an Internet scavenger hunt to French-Canadian sites to find primary source information. Have students re-create authentic products.	FL 2.1	4, 5, 6, 7
④ Search Canadian museum sites to learn how French-speaking Canadians of the era dressed. Have students scan pictures from library books (be careful to observe copyright law). Use both print and multimedia encyclopedias. Students may want to re-create headwear or other pieces of clothing.	FL 2.2	6, 7, 8
⑤ Learn some of the *voyageurs'* songs through folk song sites and electronic music libraries. Videotape class performances. Critique videos on enunciation, clarity of sound, and overall understandability.	FL 3.1	5, 8
⑥ Reinforce students' knowledge of North American geography and mapping using French vocabulary. Obtain a French language map of North America through Canadian geography Web sites. Electronically map the *voyageurs'* itinerary.	FL 3.1	1, 4, 5, 8
⑦ Compare Native American and French-Canadian food, customs, and clothing. Note French words that are used in both regions to describe the same item. Prepare food samples and have students describe them.	FL 4.2	6, 7, 8
⑧ Have students wear their handmade tuques and reenact the lives of the *voyageurs* for other classes or their parents. Include the electronically developed itinerary, imaginary diaries, and pictures obtained through searches. Videotape the production for later viewing and sharing with friends and family.	FL 5.1	5, 8

Tools and Resources

SOFTWARE:

- Database, word-processing, mapping, desktop-publishing

WEB SITES:

Ideas for studying voyageurs
www.lafete.org/v_ger/voyF.htm

Fur trading in New France
www.civilization.ca/cmc/cmcfra/ca12fra.html

Library of Congress maps (maps of North America)
http://lcweb2.loc.gov/ammem/pmhtml/panhome.html

Museums of the New World in France (several museum collections)
www.culture.fr/culture/nllefce/fr/mu_17086/index.htm

Several French Canadian Culture Museums in Canada
http://frenchcaculture.about.com/msub15.htm?pid=2744&cob=home/

Canadian Museum of Civilization
www.cmcc.muse.digital.ca/cmc/cmceng/canp1eng.html
www.cmcc.muse.digital.ca/cmc/cmcfra/canp1fra.html

History of Maple Syrup Production in Quebec
www.erabliere-lac-beauport.qc.ca/musee.htm

Canadian and Montreal History
www.mcgill.ca/mccord/

Virtual Museum of New France
www.vmnf.civilization.ca/somm-en.htm

Musée virtuel de la Nouvelle France
www.vmnf.civilization.ca/somm-fr.htm

Fur trade in New France
www.vmnf.civilization.ca/popul/coureurs/index-en.htm

Maps and Navigation of New France
www.vmnf.civilization.ca/popul/coureurs/merchant.htm

Geography of Canada with activities
www-nais.ccrs.nrcan.gc.ca/schoolnet/
www-nais.ccrs.nrcan.gc.ca/francais/home-french.html
www-nais.ccrs.nrcan.gc.ca/wwwnais/select/explore/english/html/eexplor3.html

Maps of North America and Northwest Territory (1650–1817)
http://images.grainger.uiuc.edu/~maps/maps86/ilmaps.htm

Canada's NetSchool or Rescol, canadien, joining schools and libraries in Canada, to provide information and research opportunities
www.schoolnet.ca/home/f/index.html

Materials and resources for children and teachers: Elementary and Secondary: Songs, cultural information, activities, etc., in French and English.

www.lafete.org/Ft_f/Af_INDX.htm
www.lafete.org/Ft_e/Ae_INDX.htm

OTHER:

- A Great Lakes Fur Trade Coloring Book (Les Fourrures et Les Grands Lacs: Cahier colorier). ISBN 0-87351-154-9. Minnesota Historical Society, 345 W. Kellogg Blvd, St. Paul, MN 55102-1906; ph. 651.296.8760 (Museum store) or 651.296.2264 (MHS Press) or 651.296.6126 (general information).*
- Songs of the Voyageurs by Theodore C. Blegen, CD and companion book. Minnesota Historical Society (see above).*
- French-language videotape, Les Voyageurs. Canadian Film Distribution Center, SUNY Plattsburgh, Hawkins Hall 025, Plattsburgh, NY 12901; ph. 800.388.6784.*

  http://canada-acsus.plattsburgh.edu/900/966.htm (French) Les Voyageurs– #VHS V-966 (19 minutes, color, 1964, Rental $15).
  http://canada-acsus.plattsburgh.edu/900/967.htm (English) The Voyageurs– #VHS V-967 (19 minutes, color, 1964, also available for purchase VHS $90).

Ingredients for pea soup; materials for making tuques, the headwear of the voyageurs.

Assessment

Evaluation measures include rubrics and observations to assess (1) written components (mapping and fictional diaries), (2) individual and collaborative strategies in the performance of the reenactment, and (3) the completion of a *tuque*, following directions in French.

Credits

Barbara C. Anderson and Maureen Curran-Dorsano, Normandale French Immersion School, Edina, Minnesota

Margot M. Steinhart, Barrington High School, Barrington, Illinois

Comments

Although this lesson sequence was originally implemented by a Grade 4 teacher at Normandale French Immersion School (Edina, Minnesota), teachers in regular classrooms have modified the activities to fit their social studies and language arts units by introducing French as an area of study and communication. Several teachers note that the inclusion of foreign language activities within their curricula has increased young children's awareness about communication, clarity of words, and similarity of words between languages. Many students have expressed more interest in studying a foreign language as a result of feeling comfortable with learning French in this immersion context.

Keypals

Foreign Language

Middle Grades 6–8

Purpose

Students use a variety of technological resources to communicate in a foreign language with students of other cultures. By making a positive connection, students become "ambassadors" and gain insight into the practices and products of other countries.

Description

Students make electronic connections with classes in other countries, exchanging information for the purpose of exploring languages and cultures. During the yearlong exchange, schools work together on projects of common interest while students gain a truly international experience and perspective.

Note: The following series of activities is a nonsequential list of ideas designed to assist the teacher of any foreign language in working with keypals. No specific language has been provided so that teachers can adapt these ideas to their own needs. Although the standards are tied to Grades 6–8, the activities can be altered to become developmentally appropriate for most grade levels.

Activities

PREPARATION

- ▷ Join a listserv for teachers in the country of the language being studied to increase professional vocabulary and to find teaching ideas as well as a group with which to exchange ideas.
- ▷ Locate Web sites for students to examine. Be sure to screen sites thoroughly for inappropriate material.
- ▷ When matched with a classroom, gather information about students before assigning keypals. Pair students who share similar interests, or use other predetermined criteria.

PROCEDURE	FOREIGN LANGUAGE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
① Write messages of introduction to keypals that provide information to stimulate conversation. Be sure to have students initiate dialogue by asking questions of their keypals.	FL 1.1, 1.2	7
② Write both individual and group messages that share information about the school, activities, holidays, foods, and plans for the future. Send digital and scanned photos with accompanying descriptions.	FL 1.1, 2.1	3, 5, 7
③ Create a class Web page to share information about keypals with a larger school audience. Import the keypals' digital images and descriptions as a way of sharing progress in communication.	FL 1.3, 2.1, 2.2	3, 4, 6, 10

	FOREIGN LANGUAGE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
④ Send digital sound and video clips to keypals. Discuss with students the idea of speaking clearly, focusing on appropriate pronunciation.	FL 1.3, 5.1	4, 5, 6, 7
⑤ Exchange recipes and sample menus. Ask for advice on preparation. Compare menus for typical meals. Re-create keypal menus for sharing. Videotape the event to share with both keypals and the community. Send digital pictures and video clips of the event to keypals.	FL 2.1, 2.2	5, 6
⑥ Exchange electronic holiday greeting cards. Be sure to inform keypals of the significance and importance of national celebrations. For example, not all countries celebrate Easter or understand the notion of the Easter rabbit.	FL 2.1, 2.2, 4.2	3, 4
⑦ Research and provide information on academic subject areas that may not be readily available to keypals. Have students share their study topics in other subject areas or classes in which they are working on projects. Keypals may be able to help each other gather information.	FL 3.1, 3.2	3, 4, 7, 10
⑧ Have students create a learning sequence or Web page for keypals on topics of mutual interest, or topics unique to local culture.	FL 2.1, 2.2, 3.1, 4.1	5, 6, 7, 10
⑨ At the end of the year, students create a multimedia presentation of yearlong interaction with keypals. This should include samples of work sent and received as well as a reflection on the value of the experience as it relates to both learning about others and increased knowledge or fluency in the target language.		
⑩ Plan a visit with foreign keypals in their country, as well as a keypal visit to the United States. Create an itinerary, budget, packing plan, and so on with help from keypals. Have keypals work collaboratively on both visits to create itineraries and budgets.	FL 1.1, 2.1, 4.1, 5.1	3

Tools and Resources

SOFTWARE:

▷ Web page creation (e.g., FrontPage, Home Page—formerly Claris Home Page), voice-recording program (e.g., Eudora Light 3.1 with Pure Voice)

HARDWARE:

▷ Digital camera, scanner

WEB SITES:

▷ For finding keypals/project partners:

epals Classroom Exchange:
www.epals.com/

Global Schoolhouse:
www.gsn.org/

Intercultural E-Mail Classroom Connections:
www.stolaf.edu/network/iecc/

Global Rigby:
www.reedbooks.com.au/rigby/global/keypal.html

Web66:
http://web66.coled.umn.edu/

Kids' Space Connection:
www.ks-connection.org/

OTHER:

▷ Consultants for various projects (e.g., Native Americans, anthropologists, sociologists)

Assessment

Each activity is assessed within its context and guiding objectives. Teachers and students can create specific criteria that define quality interactions with keypals in foreign languages. If the objective is to foster interaction between students, the teacher should avoid interjecting too many assessment criteria that stifle spontaneous and frequent interaction. The culminating multimedia project should also be scored on a rubric. At this developmental level, students should help define the various levels of the rubric as the teacher defines minimum expectations.

Credits

Dale Wenburg, Sheridan Junior High School, Sheridan County School District No. 2,
Sheridan, Wyoming
(wenburg@wavecom.net)

Adapted from a learning scenario submitted by Lucy Lee (Livingston High School, Livingston, New Jersey) for *Standards for Learning Chinese*, Chinese Language Association of Secondary-Elementary Schools, 1998.

Comments

The keypal project has had three years of successful integration in Dale Wenburg's foreign language curriculum. Foreign keypals have visited Sheridan and in 1998 Sheridan students traveled to France for a keypal visit. The project has provided a truly international educational experience.

Teachers who have students who cannot visit foreign countries have found that the keypal experience is significantly enhanced when digital pictures are exchanged. Students enjoy finding out that a unique person really is on the other end of the exchange. Several Midwestern teachers have recounted that creating a calendar of activities, such as joint science projects, progressive stories, and simple tasks (e.g., movie reviews) kept the keypal relationship alive and thriving. The teachers expressed concern, however, that both classes or groups must be committed to long-term, high-quality interaction, or the exercise develops no genuine meaning for students.

Servus in Österreich: Welcome to Austria

Foreign Language (German)

Secondary Grades 9–12

Purpose

Using German, students study Austria in general and two Austrian states—Carinthia (Kärnten) and Burgenland—in particular. Students use technology to develop an understanding of why Austrians and those who visit Austria value the natural beauty of both Carinthia and Burgenland. Students gather information on the Internet to develop an understanding of the roles of these two states within Austria.

Description

In this learning activity, the described Internet resources allow students to do exercises before and after reading; these exercises have been designed to support the mastery of vocabulary and the structures needed to understand and communicate effectively in German on the topic of Austria. Students learn about the practices and products of the Austrian culture, communicate about differences between their own and Austrian culture, and draw comparisons between their own lives and the lives of typical Austrians.

Note: The following set of activities is designed around a single Web site that incorporates existing Web sites in Austria to help students learn about that country. The Web site has been enhanced through Java scripting to ask various levels of questions about what is available on the targeted site. This format is not unique to Austria or the German language. With some instruction in Java scripting, teachers can create comprehensive Web sites such as this one to meet their own objectives in the instruction of any foreign language. Additionally, language development focused Web sites are continuing to emerge on the Internet.

Activities

PREPARATION

- ▷ Identify additional Internet sites to support learning about Austria. Sites are embedded in the example provided in Tools and Resources.
- ▷ Develop in-class communication activities that allow students to use the information and knowledge they gather through the Internet.

PROCEDURE	FOREIGN LANGUAGE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
① Visit the seven Internet sites found through the example site listed in Tools and Resources. Copy the Web addresses of individual sites that merit return visits. Complete the interactive pre- and post-exercises for each site.	FL 1.2, 2.1, 2.2, 3.2, 4.2	2, 7, 8
② Explore the geography portions of the Web sites and develop an awareness of Austria's geographical features and how they influence the culture, the economy, and the social fabric.	FL 1.2, 2.1, 2.2, 3.2, 4.2	2, 3, 7, 8
③ Explore selected Internet sites and gain an awareness of the youth hostel system and its function within Austrian culture.	FL 1.2, 2.2, 3.1, 3.2, 4.2	2, 7, 8
④ Explore selected Internet sites and learn about camping and outdoor activities that are common in Austria.	FL 1.2, 2.2, 3.1, 3.2, 4.2	2, 7, 8

	FOREIGN LANGUAGE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
⑤ Explore selected Internet sites and become aware of the role of tourism and its importance in Austrian culture.	FL 1.2, 2.2, 3.1, 3.2, 4.2	2, 7, 8
⑥ Interact in contextualized learning activities to acquire the necessary language to conduct the project.	FL 1.1, 1.2, 1.3, 4.1	
⑦ In small groups, create a multimedia presentation to be used in a 10–15-minute video interview with the teacher. Students explain which states they would like to visit, where they would stay, what they would do, and respond to the teachers' questions about Austria.	FL 1.1, 1.2, 1.3, 2.1, 2.2, 4.1	2, 8, 9, 10
⑧ Create a diary, travelogue, or a visit of fixed duration to one of the places visited during the Internet exercises. The diary can include descriptions of scenery, the activities of a particular day, a poem, details of a new friendship, and so on.	FL 1.2, 1.3, 2.1, 2.2, 4.1	

Tools and Resources

SOFTWARE:

▷ Multimedia-authoring, word-processing

HARDWARE:

▷ Video camcorder

WEB SITE:

Kärnten oder Burgenland:
www.imsa.edu/edu/forlang/gr/exercises/seven/

Assessment

The video interview and the diary can be evaluated based on a rubric developed for each assessible item. The rubric for the oral interview should include vocabulary in context, language functions, accuracy of syntax and grammar, pronunciation, fluency, cultural accuracy, and demonstrated ability to recycle previously learned language. The rubric for the written diary should include vocabulary in context; language functions; accuracy of spelling, syntax, and grammar; cultural accuracy; the ability to recycle previously learned language; neatness; and originality of content, design, and layout.

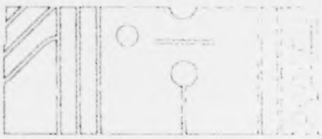
Credits

John H. Stark, German Faculty, Foreign Language Team, Illinois Mathematics and Science Academy, Aurora, Illinois
(stark@imsa.edu)

Comments

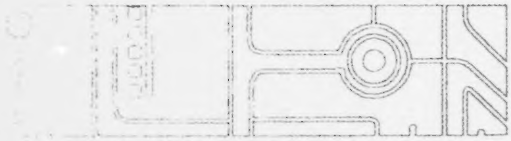
This lesson sequence was implemented by John Stark in level two German classes at the Illinois Mathematics and Science Academy. Teachers in Vista, California, took the idea of Java scripting attached to a specific country's Web sites by having the students extract the scripting to create their own Web pages on a country or location and insert their own translations as pop-up buttons. The resulting real context tested students' language learning in a profound and unique way.

Notes:



Mathematics Learning Activities

- ▷ Introduction
- ▷ PreK–2 A Number a Day
- ▷ PreK–2 Beanie Babies® Basics
- ▷ 3–5 Million Dollar Project
- ▷ 3–5 What's My Structure?
- ▷ 6–8 Design Your Own Bedroom
- ▷ 6–8 Getting It Right! An Investigation of the Pythagorean Theorem
- ▷ 9–12 Chaos and Beyond
- ▷ 9–12 Lining Up Data



INTRODUCTION

Mathematics Learning Activities

Technology is an important resource for teaching and learning mathematics. Calculators, computers, and the World Wide Web are invaluable for students and teachers in the classroom. Technology allows students to visualize and experience mathematics in heretofore impossible ways, engage in real-world (rather than contrived) problem solving, perform rapid and complex computations, and generate their own representations of their own learning. Furthermore, technology allows students to undertake projects that connect with global communities, integrate mathematics with other subjects, and fit students' individual needs and interests.

Information and communications technologies provide resources for enhancing, modifying, and connecting mathematics education to real-world applications. Resources that support this learning include the Internet, graphing calculators, simulation and spreadsheet software, real-time videoconferencing, and virtual reality simulations.

The Technology Principle is one of the guiding principles of the National Council of Teachers of Mathematics' *Principles and Standards for School Mathematics* (NCTM, 2000). It states, in part: "mathematics instructional programs should use technology to help all students understand mathematics and should prepare them to use mathematics in an increasingly technological world." Technology facilitates the transition from traditional mathematics to real-world problems. Instruction in mathematics is shifting from topics taught in isolation to presenting realistic problems to student researchers.

Technology can play a role in enhancing mathematical thinking, student and teacher discourse, and higher-order thinking by providing the tools for exploring and discovering mathematics. Technology allows students to reflect on their activities and promotes reflective and cognitive processes in their problem solving that go below the surface *and* connect with the real world.

PREVIEW OF LEARNING ACTIVITIES

Primary grade students explore classifying and sorting using popular stuffed toys such as Beanie Babies®. They further investigate the multiple ways of expressing numbers through daily calendar activities.

Grades 3–5 students explore two- and three-dimensional structures using virtual reality and communications software. They further investigate large numbers, working with money and relative cost of items by attempting to spend a million dollars.

Students in Grades 6–8 use measurement and design tools to create an ideal bedroom. They also explore the development of the Pythagorean Theorem through manipulating the sides of right triangles.

High school students use geometry representation software to investigate the properties of mathematical functions. Additionally, they have the opportunity to utilize real-world data to explore the beauty of fractals and chaos theory.

These lessons and activities are representative of the many possibilities for technology-rich mathematics instruction that is firmly grounded in both the NCTM and NETS for Students.

A Number a Day

Mathematics

Primary Grades PreK–2

Purpose

This activity is designed to help students understand:

- ▷ The concept of number and its relationship to the calendar
- ▷ What a calendar is and how it can be used to keep track of time
- ▷ One-to-one correspondence and sequencing numbers

Additional understandings include that:

- ▷ Mathematics is a symbolic language common to all cultures
- ▷ Mathematics is everywhere
- ▷ Knowledge of numbers enhances students' understanding of the world around them
- ▷ Technology can add to students' knowledge by allowing them to electronically retrieve information
- ▷ Technology can help students communicate local, original ideas to a larger audience

Description

Most primary grade classrooms begin the day with a discussion about the day, date, weather, and so on, setting the tone and context for the activities that follow. As students study the current day, its name, and its number, they develop mathematical ways to express the number (e.g., equations, birthdays, number of boys or girls in the class, number of teeth lost so far that month, etc.).

Using information found on Web sites, students create a more complete record of their representations of the day's number. This record can be created using drawing or painting software, videotaped for school announcements, published in a classroom newsletter, or inserted on a classroom Web page.

Note: The complexity of this activity is determined by students' current mathematical understandings. The Web sites provided in Tools and Resources should be explored thoroughly for information that will best help students. In addition, using weather-related literature significantly enhances the study of the day, the date, the season, and so on.

Activities	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK–2
① As part of opening activities, students complete sentences such as: "Today is ____," "Yesterday was ____," "Tomorrow will be ____," "The day before yesterday was ____," and "The day after tomorrow will be–." Use numerals with each date as well as the word: for example, "Today is Tuesday, March 10th."	MATH 1, 8, 10	2, 8, 10
② Facilitate a discussion about the number that represents the date. Ask students to express the number in many different ways and relate it to things in the classroom (e.g., number sentences and equations, number of students with siblings, a birth date, the number on a football jersey, the dates on money, etc.). When they have finished, have students record these	MATH 1, 8, 10	1, 2

	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK–2
ideas using a whiteboard or chart paper, or using drawing or painting software.		
③ Guide the class in visiting a Web site that further explores the number. As the class exhausts its own ideas, facilitate further exploration by demonstrating or pointing students to various Web sites that show the day's number from different perspectives. Students enjoy finding ways to express numbers that are similar to their own.	MATH 8, 10	4, 6, 10
④ Keep a visible record of student discoveries. Periodically have students examine their results as a group to see if any patterns emerge in the ways to represent numbers. By discovering patterns, students will link some of the more complex mathematical concepts to real information, earlier than scheduled on the district's scope and sequence!	MATH 2, 5, 10	10
⑤ Make connections to other curriculum areas, including history. For example, although primary grade children have not studied Egyptian culture, the mathematical connection to the contributions made by this and other cultures can be simplistically introduced to build understanding about the rich contributions many peoples have made to mathematical understanding. Have students display their findings about numbers, patterns, and history by drawing pictures, creating multimedia presentations, and any other method or activity that is appropriate for the developmental level of the students.	MATH 4, 8, 10	4, 8, 9

Tools and Resources

SOFTWARE:

- ▷ Drawing or painting (e.g., Kid Pix Studio, Kid Works Deluxe), Presentation (e.g., Kid Pix Studio, ClarisWorks for Kids, AppleWorks)

WEB SITES:

About Today's Date:
http://acorn.educ.nottingham.ac.uk/cgi-bin/daynum/

The Daily Calendar and Almanac Page:
http://members.xoom.com/Ari_Kukkonen/today.html

The One and Only 1 Page:
www-personal.umich.edu/~danhorn/digits/one.html

The Digits Project:
www-personal.umich.edu/~brinck/digits/digits.html

Yahooligans—This Day in History:
www.yahooligans.com/docs/tdih/

This Day in History (The History Channel):
www.historychannel.com/today/

OTHER:

- ▷ Presentation equipment to display Web sites to the whole class (large screen monitor, LCD panel, or classroom television connected to a computer)

Assessment

Observe students working in groups or individually to explain how the day's number occurs in their environment. The explanations are presented to the entire class and published as part of a classroom newsletter, as a feature on the school's daily announcements, or posted on a classroom Web site. Keep anecdotal notes on how students are able to connect the various expressions of numbers to other classroom experiences.

Credits

Susan Nothwehr, Spencer Community Schools, Spencer, Iowa
(snothwehr@spencer.k12.ia.us)

Comments

The calendar and the number of the day are parts of a daily discussion in most primary classrooms. Students become adept at coming up with original ways to express a number. Using the Internet as a resource to add to the class's activity enriches and expands what students can learn. Consider having students use a digital camera to explore their school environment and photograph the graphic representations of the various numbers used in the date. Look for unusual places where numbers are found—in a public building, building numbers, streets, room numbers, codes for parts of mechanical devices, and so on. Our students have enjoyed this "treasure hunt for numbers."

Beanie Babies® Basics

Mathematics

Primary Grades PreK–2

Purpose

Students use Beanie Babies to calculate amounts, sort and classify, as well as work cooperatively on a project. By using technology resources, they count and record, practice their problem-solving and communication skills, and illustrate their results, thoughts, and ideas.

Description

This learning activity capitalizes on students' fascination with Beanie Babies. Students bring their Beanie Babies to school (or other popular toys) to count, classify, tally, and graph according to student-selected categories such as "clothed or unclothed," "feathers or fur," "real or imaginary," color, number of legs, and animal family. Students create new Beanie Babies electronically, using their creations for mathematical comparisons and technological excursions and discoveries. After completing this study, students electronically contact another class and compare Beanie Babies data by e-mail.

Note: Although this activity is constructed around the notion of Beanie Babies, any seasonal or popular toy can be used.

Activities	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK–2
① Ask students to bring their favorite Beanie Babies to school for a math lesson. (Be sure to get parental permission and to set rules about where and how Beanie Babies are handled and stored.)		
② Once students have their Beanie Babies, ask them to count the total number of Beanie Babies at their table, then add individual totals for a class total. Lead a discussion on different ways in which the Beanies could be classified: These classifications are entered into a simple database so that the Beanies can be sorted in different ways. This is a great opportunity to discuss attributes. Consider making a matrix with the attributes across the top and the names of the Beanie Babies down the side. In the cells, indicate the characteristics of the toys. Many generalizations can be drawn from collecting data in this manner.	MATH 1, 2, 5	1, 3, 4, 5, 7
③ Using graphing software, have students graph their results using specified attributes. The power in the graphing is the discussion or debriefing that follows.	MATH 10	1, 2, 4, 9
④ Use the Beanie Babies Collection Birthday Roster Internet site to help students find which birthdays real Beanie Babies are not using. Using drawing or painting software, new Beanie Babies can be created by the students and assigned birthdays.	MATH 3, 5	5, 9, 10

	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK-2
⑤ Have students weigh and measure their Beanie Babies using a balance scale and either rulers (standard measurement) or Unifix cubes (nonstandard measurement). Record the data in a database and compare results.	MATH 4	1, 3, 4, 5, 7
⑥ Compare the Beanie Babies to the real animals they represent. Have students investigate each real animal through a multimedia encyclopedia to find the animal's length, weight, and other characteristics. After all comparisons have been made, the children can rank the real animals by size. This is also an opportunity to make fractional or ratio comparisons of stuffed to real animals. (This is an important language development connection.) Animals can be classified again by real size.	MATH 2, 4, 9	5, 9, 10
⑦ Design Beanie Babies using geometric shapes. Students may use software such as Shape Up from Sunburst Communications. These stylized Beanie Babies provide an opportunity to use geometric language and creative expression to name each new animal and write a story about it.	MATH 3	5, 8, 9
⑧ Contact another class by e-mail to compare data for the Beanie Babies. Have students draw conclusions based on the comparison.	MATH 5, 8	9, 10
⑨ Have the class share its data on Beanie Babies. Check the Beanie Babies Web site for input options. Use a search engine such as Infoseek or Hotbot to connect to other resources about Beanie Babies.	MATH 8	10

Tools and Resources

SOFTWARE:

- Database (e.g., Tabletop), drawing or painting, graphing (e.g., Tabletop, Graph Club, GraphPower), geometry (e.g., Shape Up by Sunburst Communications), multimedia encyclopedia (e.g., Encarta), CD-ROMs about animals

WEB SITES:

Ty Company:
www.ty.com/

Beanie Babies Collection Birthday Roster:
www.ohio-usa.com/beaniebabies/birthday.html

- For finding keypals/project partners:

epals Classroom Exchange:
www.epals.com/

Global Schoolhouse:
www.gsn.org/

Intercultural E-Mail Classroom Connections:
www.stolaf.edu/network/iecc/

Global Rigby:
www.reedbooks.com.au/rigby/global/keypal.html

Web66:
http://web66.coled.umn.edu/

Kids' Space Connection:
www.ks-connection.org/

OTHER:

- Beanie Babies, balance scales, rulers, unifix cubes

Assessment

Entering characteristics of a Beanie Baby into a database will help assess students' abilities to identify characteristics as well as classify and sort by specific criteria.

Using the students' completed graphs, assess students on their ability to construct the graph and interpret the results correctly by comparing data.

Credits

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Comments

Various versions of this learning activity have been done using teddy bears, matchbox cars, stuffed animals, and so on. The phenomenon of Beanie Babies and the Internet, however, have added an entirely new dimension to the project. We have seen parents buying Beanie Babies as investments, thus making their children aware of the increasing value of Beanie Babies as posted on the Internet. Even the youngest children have followed their Beanie Babies' increasing value. Some teachers have had their students graph the value of a specific Beanie Baby over time, speculating on its ultimate value when sold at a fictitious sale at the end of the school year.

It may be helpful to have a parent or aide assist in visiting Beanie Babies Internet sites.

Million Dollar Project

Mathematics

Intermediate Grades 3–5

Purpose

Students use technologies such as spreadsheets, the Internet, and presentation software to represent and solve a problem that involves large numbers, number sense, place value, and the real world.

Description

Each student is given the task of spending $1 million. The way students spend their money is dependent on a theme such as creating a dream world, taking a trip, or doing something to better society. All students research, document, and present the ways in which they plan to spend their money.

Activities

	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
① Introduce the project by explaining and describing the concept of one million. Many children's books have story lines about this quantity. Visit the library or media center with students and look up print materials on conceptualizing a million items. Spend time on a clear definition of the expectations of the final project or presentation. Be sure to tailor the desired outcomes to meet the district and grade level curriculum specifications with the available technology.	MATH 1	10
② Because students are spending money, a commodity they understand, create a theme and categories for how the money is to be spent. Students can brainstorm ideas as a whole class. Sample themes include creating a dream world, taking a trip, and bettering society. Categories will depend on the theme, but include such elements as transportation, housing, food, entertainment, and luxuries. Remember: Money is a quantity tha[illegible] measured and labeled.	MATH 4	4
③ Using a spreadsheet, students create the categories needed for their chosen theme. They use formulas to make sure they spend as close to $1 million as possible. Be sure to check their skills and understanding of how a spreadsheet works before doing this activity.	MATH 1, 2, 6	4
④ Use a variety of resources to document the costs of items in each category. Students need to evaluate sources for accuracy and use effective research skills. Many commercial Web sites provide pricing information. Students need to be critical consumers of information, making decisions about what sources are accurate and reliable in terms of the products they desire.	MATH 5	1, 6, 7, 10

	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
⑤ Students organize information using various forms of technology to create a multimedia presentation. As with spreadsheets, be sure students have the elementary skills to use the software effectively. Once the concept is clear, have students focus on effective communication of their ideas. This will help them clarify their thinking.	MATH 10	1, 4, 7
⑥ Students final projects should include: ▷ A spreadsheet of findings ▷ A narrative of lessons learned ▷ Graphic representations of how they spent their money ▷ Graphics that illustrate their purchases	MATH 8, 10	4
⑦ All class information can be combined in one spreadsheet for group analysis. Students can brainstorm different ways to compare and contrast the data. Results can be displayed using charts and graphs. For example, students can use sorting procedures to find the 10 most popular items purchased.	MATH 5, 8, 10	4, 10
⑧ For a more global approach, students can connect with other classrooms to compare results of their projects. Cultural and economic comparisons can be made when analyzing the choices made in spending the money. Additional minilessons can include finding the equivalent value of $1 million in the currency of the distant classroom.	MATH 10	10

Tools and Resources

SOFTWARE:

▷ Spreadsheet, presentation (e.g., PowerPoint, HyperStudio, ClarisWorks for Kids, AppleWorks), Web page creation

WEB SITES:

Grade 5 Unit 4 Million Dollar Project Resources:
www.kent.wednet.edu/curriculum/math/edmath/gr5/unit4/million_resources.html
(from Simona Funk, fifth-grade teacher in Kent, Washington)

Million Dollar Project Resources:
www.stlpark.k12.mn.us/sl/projects/million/million.html
(from Kristie Weigel, Brian Stuckey, Julie Richmond, and Judy Hoffman)

Furniture (includes many links to children's furniture sites):
http://dir.yahoo.com/Business_and_Economy/Companies/Children/Furniture/

iOwn, Inc. (house-finding site):
www.iown.com/

CarSmart (automobile search site):
www.carsmart.com/

Apartments.com (apartment search site):
www.apartments.com/index.htm

Outpost.com (computer resource site):
www.outpost.com/

NECXdirect (computer software and hardware):
http://necxdirect.necx.com/cgi-bin/auth/docroot/index.html

VacationSpot.com (vacation-planning site):
www.vacationspot.com/mc.htm

Lycos World Issues:
www.lycos.com/wguide/network/net_12604089.html

Lycos Image Gallery:
www.lycos.com/picturethis/

Ragland (animated GIF gallery):
www.geocities.com/Heartland/9492/graphics.html

Icon BAZAAR:
www.iconbazaar.com/

▷ For finding keypals/project partners:

epals Classroom Exchange:
www.epals.com/

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Global Schoolhouse:
www.gsn.org/

Intercultural E-Mail Classroom Connections:
www.stolaf.edu/network/iecc/

Global Rigby:
www.reedbooks.com.au/rigby/global/keypal.html

Web66:
http://web66.coled.umn.edu/

Kids' Space Connection:
www.ks-connection.org/

OTHER:

- ▷ Newspapers, magazines, catalogs, personal interviews, other research materials

Assessment

A sample evaluation for Grade Sheet for Million Dollar Display and Presentation can be found at www.kent.wednet.edu/curriculum/math/edmath/gr5/unit4/grade_sheet.html.

Other strategies include having students create a checklist or rubric to evaluate the elements of their final projects and how well they presented them to the class.

Peer conferencing and journals can also be used.

Credits

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Comments

We have found that students realize their mistakes and successes in planning as a result of the decision-making process. For example, one child who created a houseboat realized that she had all of the components for a kitchen, living room, bathroom, and family room but didn't have a bed to sleep on! The boat she may have purchased worked for some climates but not the one where she lived, and she wouldn't have been able to sleep on the houseboat's deck year-round!

Extension: *Create similar activities for numbers as large as one billion and various increments in-between.*

What's My Structure?

Mathematics

Intermediate Grades 3–5

Purpose

Using this activity, students will:

- Use the language of mathematics to describe in words a 3-D structure created with one-inch cubes
- Interpret a written description of a 3-D structure and re-create it with one-inch cubes
- Use QuickTime Virtual Reality (QTVR) technology to represent a 3-D structure made of one-inch cubes
- Communicate mathematical ideas with others outside of their classroom

Description

Note: This project requires two classrooms working together. They do not need to be far apart, but distance enhances student motivation.

In each of two classrooms, students create individual structures using 10 one-inch cubes. They describe their structure in words, using mathematical language. Descriptions are shared with the partner classroom by e-mail. Students in the partner classrooms try to re-create the original designs based on the written descriptions. Clarifying questions and answers are exchanged. Once the structures have been created, students represent them with QTVR movies. These movies are either sent back to the original creators by e-mail or posted to a Web page. Students check the QTVR movies of their designs for accuracy.

Activities	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
① Select a partner classroom at the same grade level. To find partner classrooms, check the sites listed in Tools and Resources. Pair students in classrooms or in pair-student groups to facilitate direct communication. Have students get to know their partner through introductory activities such as exchanging information about interests—while honing telecommunications skills.		8, 9
② Each student creates a structure using one-inch cubes. Suggested parameters include using all 10 cubes in at least two layers so that the structure stands freely on its own. Each structure must take up no more area than an 8-inch by 10-inch piece of paper. Every cube must have at least one face touching another cube. Remind students that they need to use precise language when describing their designs. Their designs, therefore, cannot be too complicated. *Note: This activity is best done with both classes designing structures and then exchanging the descriptions of the structures. All students, thus, are both designers and interpreters.*	MATH 3	
③ Review mathematically descriptive language that is appropriate to the setting and age level. Words and terms such as *vertex, edge, plane, face, top, bottom, left side, right side,* and *rotate* are important.	MATH 3, 10	

	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
④ Students write a description using mathematical language that is precise enough for another student to re-create their design. Have students e-mail their descriptions to their partners in the other class. Partners can, in turn, respond with clarifying questions.		1, 4, 6, 8, 9
⑤ Have the student designers use QTVR technology or QuickTime to make a movie that documents their design. This movie will be used to compare original designs with partners' conceptions of the structures.	MATH 3, 8	4, 5, 7
⑥ Students can either exchange movies by e-mail or post them to a Web site.	MATH 3, 8	4, 5, 6, 7
⑦ The designers check to see that the partners' movies correctly represent their designs. They communicate with their partners, letting them know the designs were correct or explaining how they were not. Students must provide feedback to designers on the strengths and weaknesses of their descriptions.	MATH 3, 6, 8, 10	4, 6

Extensions:

- ▷ Use simulation software to design cities, farms, and so on with specific dimensions and components.
- ▷ Use outlined LEGO blocks obtained electronically from LEGO at www.lego.com/worlds.asp/

Tools and Resources

SOFTWARE:

- ▷ Rendering or illustration (e.g., Dabbler, Adobe Illustrator, Adobe Photoshop, ClarisWorks for Kids, AppleWorks)

WEB SITES:

- ▷ For finding keypals/project partners:

  epals Classroom Exchange:
  www.epals.com/

  Global Schoolhouse:
  www.gsn.org/

  Intercultural E-Mail Classroom Connections:
  www.stolaf.edu/network/iecc/

  Global Rigby:
  www.reedbooks.com.au/rigby/global/keypal.html

  Web66:
  http://web66.coled.umn.edu/

  Kids' Space Connection:
  www.ks-connection.org/

OTHER:

- ▷ Enough one-inch cubes for each child to have 10 cubes
- ▷ To create a QTVR movie, students need a digital camera, free software available on the Web, a black backdrop, a turntable, and a tripod. Complete directions, equipment, and links to free software can be found at QuickTime VR (www.learningspace.org/qtvr/) and Apple Computer, Inc. (www.apple.com/).

Assessment

Students can be assessed in three areas:

- ▷ Their written description of their structures
- ▷ Their re-creations of structures based on other students' descriptions
- ▷ Their QTVR movies of the structures they re-created.

Note: A rubric for each area should be created in collaboration with students.

Credits

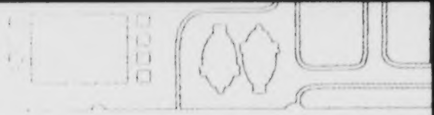
Ann McGlone, Kent School District, Kent, Washington
(amcglone@kent.wednet.edu)

Comments

This activity is a spin-off of a common activity done in classrooms in which students are paired but have a barrier between them so they cannot see each other's creations. Distance communication forces greater mathematical precision in their descriptions.

The written description is a meaningful experience for children that forces them to use correct geometrical terms such as face, edge, *and* planes. *QTVR is also a practical use of angles and distances. Students love the challenges of this project and really develop their communication skills in math and technology.*

QTVR can be attached to Web pages and HyperStudio stacks.



Design Your Own Bedroom

Mathematics

Middle Grades 6–8

Purpose

Students will:

- ▷ Use metric measurement (including units for area and volume) to perform operations on decimals and percentages in an applied activity
- ▷ Represent their mathematical problem by using a spreadsheet and drawing or painting software

Note: This activity may be tailored for standard measurement.

Description

Many students dream of designing their ideal bedroom. In this exercise, students will be required to limit their designs by size (as a specific volume) and price (a specific amount). They must design the floor plan, including furniture placement, using drawing, CAD, or home design software. They are required to select the following: floor covering, paint for walls and ceiling, and an air-conditioning and heating unit appropriate for the room's volume. Students use the Web to research these items and enter the values they find into a spreadsheet, maintaining a running total of expenditures. They present their bedrooms to the class using multimedia-authoring software.

Activities	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
① Begin by developing the concepts of area and volume through the use of manipulative materials. For example, create one-meter square paper sheets and tile the classroom floor. Measure the dimensions and calculate the area. Compare the results. Repeat for a wall of the classroom.	MATH 1, 2, 3, 4, 5, 6, 8, 9	4–7
② Introduce the project by having students determine such dimensions as the areas and volumes of their rooms at home (using measurements for walls, ceilings, and floors).	MATH 2, 4, 5	5
Extension: Enter the data into a spreadsheet and calculate room volume, mean, and mode.	MATH 2, 6	5
③ Use a spreadsheet to explore relationships between room dimensions and volume. Pose the following question: How can you maximize the volume of the room given a specific sum for the room dimensions (e.g., length + width + height = 75 meters)?	MATH 1, 6, 9	4
④ Give students project requirements and limitations (e.g., volume limitation for their rooms; cost limitations for the floor covering, paint, heating, and air conditioner; and percentage of total floor area to be taken up by objects in the room).		

	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
⑤ Have students design the floor plans of their rooms using drawing or painting, CAD, or home design software. As students work in the draw mode, have them include dimensions and floor area of all objects in their rooms, as well as the rooms' dimensions.	MATH 3	2, 5, 8
⑥ Make sure students calculate how much paint they need to paint the walls and ceilings of their rooms (assume three coats of paint). Students investigate the cost of the paint using prices found on the Internet or in a newspaper and enter the data into a spreadsheet.	MATH 1, 5	4
⑦ Students calculate the floor space in their rooms, investigating floor-covering options and prices on the Internet. Enter this data into the spreadsheet.	MATH 5, 7	5, 7, 8
⑧ Encourage students to shop for their heater and air conditioners on the Internet (based on the volume of their rooms) on the basis of function, capacity, and price. Enter the data into the spreadsheet.	MATH 5, 7	5
⑨ Have students write descriptions of their bedrooms using word-processing software. Focus on the use of descriptive language and rationale for the items the students have selected.	MATH 8	5
⑩ Individually or in groups, students create a multimedia presentation for the class using software such as PowerPoint or HyperStudio, describing the characteristics of their rooms and the rationales for their decisions.		5, 6, 8

Tools and Resources

SOFTWARE:

- Spreadsheet, presentation or multimedia-authoring (e.g., PowerPoint, HyperStudio), drawing, painting, CAD or home design, word-processing

WEB SITES:

- Figure and Ratio of Area (Java applet for determining area):
  www.ies.co.jp/math/java/ratioAB/ratioAB.html
- Vendors and suppliers, such as:
  www.homebase.com/
  www.homedepot.com/
  www.vistapaint.com/
  www.pella.com/

In addition, search Yahoo!'s home and garden section and look for Web pages of other interior decorators, suppliers of furniture, entertainment, and so on. Many suppliers' Web sites merely provide the location of the nearest store. In these cases, students can visit or call for more specific information.

OTHER:

- Manipulative for development of area and volume concepts, metric rulers

Assessment

Although students should help design an appropriate rubric, here are some assessment suggestions:

- Ability to measure metric lengths (expressed as meters and decimals, e.g., 5.25 meters)
- Ability to calculate areas and volumes in square meters and cubic meters
- Ability to calculate percentages
- Ability to multiply accurately and add decimal values
- Ability to create floor plans to scale
- Ability to communicate plans using multimedia
- Ability to communicate plans in writing using a word processor
- Ability to select an appropriate air conditioner based on room volume

Credits

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James H. Wiebe, California State University, Los Angeles
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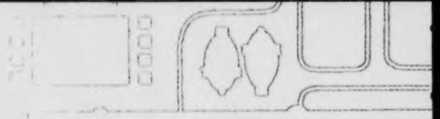
Comments

Melanie Sprouse, a seventh-grade teacher, was frustrated by her students' struggles to understand the concept of area and volume. They could calculate answers but could not apply the concept to real-life situations. She used this project to help them apply their knowledge and found that the students were not only enthusiastic and engaged in the learning, but also understood the concept better and successfully applied their knowledge in unfamiliar situations. Students frequently referred to the project, telling one another, "You know how to do this. It is just like figuring the wallpaper in your room!"



Getting It Right! An Investigation of the Pythagorean Theorem

Mathematics

Middle Grades 6–8

Purpose

The Pythagorean Theorem is one of the most useful relations in mathematics. In the middle grades, an investigation of the lengths of the sides of right triangles and the area of squares drawn on those sides introduces students to irrational numbers, Pythagorean triples (derived from right triangles with integer sides), and methods of indirect measurement used for solving real-life problems.

These activities:

- ▷ Engage students in an investigation of these relationships using manipulatives and technology
- ▷ Help students generate their own conjectures and examine "visual proofs" of the Pythagorean Theorem
- ▷ Help students apply the theorem to real-world situations

Description

Students construct a variety of right triangles using a right-angled set square, cutting corners from pieces of paper or cardboard, or using dynamic geometry software. They measure the sides of these various right triangles and record measurements in a spreadsheet. Students use the spreadsheet to look for possible patterns in the measurements. They also use the spreadsheet to square the values of each measurement and look for possible relations among squared values.

Once the Pythagorean relation has been established, students generate visual proofs using duplicate cutouts of right triangles and the dynamic software. They search the Web for information on Pythagoras and many different visual proofs. They investigate the possible generalization of the theorem to other similar shapes drawn on the sides of right triangles using dynamic geometry software. As a culminating activity, students use the Pythagorean relation to find an estimate for the diagonal distance between two points on opposite sides of their school building.

Activities	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
① Working in groups of three or four, students create a variety of right-angled triangles by cutting corners from rectangular sheets of paper or cardboard using a straight edge. Each group measures the three sides of their triangles and enters the measurements into a spreadsheet. Students investigate relations between the long side of each triangle and the two shorter sides. Introduce the terms hypotenuse (long side) and legs (shorter sides).	MATH 2, 3, 4	4, 5
② Groups share with the whole class the patterns or relations they have found. Most likely, someone in the group suggested squaring the measures and summing the squares of the legs. If not, then suggest this as an exploration.	MATH 2, 3, 4	4, 5

	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6-8
③ Use The Geometer's Sketchpad (Key Curriculum Press) or other dynamic geometry software to extend the investigation and form generalizations. Students create a script for constructing right triangles, take measurements using Sketchpad, square these measurements, sum the squared legs, and see how this sum compares to the squared hypotenuse as they dynamically change the side measurements of their right triangles. Using a script for constructing squares, students construct a square on each side of their right triangle, measure the areas of these squares, and investigate relations among the areas. Students should also construct squares on the sides of nonright triangles to see if the relationships hold for any triangle.	MATH 2, 3, 4, 7	4, 5, 6, 8
④ As an experiment, construct other polygonal figures on the sides of the right triangle. Students create scripts for various polygons (e.g., equilateral triangles and pentagons). With the constraint that the polygons on each side must be similar, have students measure the areas and investigate relations among these areas. The goal is to have students make their own conjectures about these relationships. They can also construct semicircles on the sides of the triangle and investigate the areas of the three semicircles.	MATH 2, 3, 4, 7	4, 5, 6, 8
⑤ Building from students' conjectures about the relationships of the three areas, introduce the Pythagorean Theorem—if students haven't already mentioned it themselves! Have students research Pythagoras and his contributions to mathematics. Hundreds of Web sites examine Pythagoras. Students can use these to find information.	MATH 8, 9	7, 10
⑥ Construct visual proofs of the Pythagorean Theorem using cardboard cutouts. Have groups find at least four different visual proofs they've learned from the Web sites. Students should demonstrate these proofs to the rest of the class using their own reasoning from the visual demonstrations.	MATH 3, 7, 8, 9, 10	2, 4, 9, 10
⑦ Using Sketchpad, investigate the dynamic proofs illustrated in *Pythagoras Plugged In* (Bennett, 1995). Have groups brainstorm their own dynamic proofs of Pythagoras's Theorem using Sketchpad.	MATH 3, 6, 7, 8	4
⑧ Use the Pythagorean Theorem to determine the distance between two points in a rectangular coordinate system. If the school has been plotted on a grid system, use the school map. To apply the Pythagorean Theorem, have groups calculate an estimate for the distance between two points on opposite sides of the school building. Using trundle wheels or tape measures, students can measure the legs of a right triangle that connect the two points indirectly by going around the school building; from these measurements, they can calculate the straight-line distance between the two points.	MATH 2, 3, 9, 10	
⑨ Using a spreadsheet, investigate integer values for the three sides of a right triangle (these are called Pythagorean Triples).	MATH 1, 2, 9	4

Tools and Resources

SOFTWARE:

- Spreadsheet, The Geometer's Sketchpad (Key Curriculum Press) or Cabri Geometry (Texas Instruments)

WEB SITES:

- Pythagoras's Theorem:

  www-history.mcs.st-and.ac.uk/history//Diagrams/PythagorasTheorem.gif/

  www.sunsite.ubc.ca/DigitalMathArchive/Euclid/java/html/pythagoras.html

  http://geocities.com/CapeCanaveral/Launchpad/3740/

- Add-on modules for The Geometer's Sketchpad:
  www.keypress.com/product_info/modules.html

BOOK:

- Bennett, D. (1995). *Pythagoras plugged in: Proofs and problems for The Geometer's Sketchpad.* Berkeley, CA: Key Curriculum Press.

OTHER:

- Trundle wheel (for large measurements), tape measures, cardboard, straight-edge ruler, scissors, paper, pencil

Assessment

The following assessment points appear periodically within the learning activity. They can be used for formative performance assessment.

- Group reports of investigations
- Write-up on Pythagoras
- Demonstration of visual proofs with rational explanations
- Construction of dynamic proofs using the The Geometer's Sketchpad
- Application of understanding to the problem of finding the distance between two points at school

Credits

(idea adapted from the NCTM Standards, 2000)

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James H. Wiebe, California State University, Los Angeles
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Comments

The most powerful part of this learning activity, using The Geometer's Sketchpad or any other dynamic geometry software, lies in encouraging students to ask "What if?" questions. The software enables students to test their theories on their own. This exploration of conjectures and developing informal logical arguments encourages students to develop habits that are mathematically powerful. In addition, it is the classroom conversation or discourse about these conjectures and informal proofs that show their understanding and provides learning opportunities for the entire class. The spreadsheet and the dynamic software makes testing multiple theories easier, thus making mathematics thought more intriguing.

Chaos and Beyond

Mathematics

Secondary Grades 9–12

Purpose

The purpose of this activity is to:

- Introduce students to nonlinear models and dynamic chaos
- Provide an example of mathematics that is possible only because of technology
- Introduce students to the ideas of self-similarity, recursion, and fractals

Description

The notion of chaos and the beauty of fractals comes together in this learning activity as it relates to the real issues of population growth and stability of population models. The real-world tie to current issues makes this learning activity seem mathematically complex and motivates students to dive in with enthusiasm. Students use graphing technology to investigate nonlinear phenomena and create bifurcation diagrams. From an examination of the self-similarity of a bifurcation diagram, students look at fractals and ideas of self-similarity.

Activities	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
① Using a spreadsheet or graphing calculator, students plot and discuss simple linear population models where the change in population is represented by a simple birth and death rate. Investigate the idea of a stable population (and that most populations are not stable). Obtain population models from sites on the Internet (see Tools and Resources).	MATH 2, 9, 10	5, 10
② Introduce students to the Verhulst population model. Plot and discuss it using a spreadsheet or graphing calculator. Verhulst proposed his model as a differential equation $dx/dt = kx(M - x)$ where *x* is the current population, *M* is the carrying capacity (i.e., maximum population) of the environment, and *k* is a parameter that is related to the birth and death rates of the population. This is often studied as a difference equation $x_{n+1} = x_n + kx_n(M - x_n)$ where x_n is the population in the *n*th generation. It is generally useful, and not too time-consuming, to plot the first 100 to 1,000 generations using a spreadsheet.	MATH 2, 5, 9, 10	5, 8
③ The Verhulst model is closely related to the logistic equation $x_{n+1} = rx_n(1 - x_n)$ Students make graphs of the logistic equation using different control parameters and initial conditions. By changing parameters, students	MATH 2, 9, 10	5, 8, 10

investigate stability of solutions, bifurcations, and chaos. In this equation, x_n is always in the interval [0,1]. (Populations greater than 1 or less than 0 make no sense, even though they can be studied mathematically. This is the form of the equation that is studied more by mathematicians.) Students make graphs of the logistic equation using different control parameters and initial conditions. By changing the control parameter, r, and the initial population x_0, students investigate (A) stability of solutions, (B) bifurcations, and (C) chaos.

(A) For any value of the control parameter, r, on the interval [0,3], students try many different initial populations and find that all these different initial values approach a (stable) steady-state population. (The steady-state population is related to the control parameter by the equation $x = (r-1)/r$, and is found by setting $x_{n+1} = x_n$ in the logistic equation, and solving for x_n.)

To say that this population is stable means that if the population is disturbed from its stable value by a small amount, it will return to the stable value after some generations. However, for values of the control parameter greater than 3, students find that there is no single population value which is stable. (Students could try, for example, a starting value of $x = (r-1)/r$, for $r = 3.1$. They find that due to the finite precision of their calculators that this single value eventually splits into two alternating population values, $x = 0.557$ and $x = 0.765$. Other control parameters may be investigated.)

(B) Students may plot the long-term results, either the single stable population value, or the multiple values, versus the control parameter on a graph, or the students may locate a copy of the "bifurcation diagram" (see, for example, http://trixie.eecs.berkeley.edu/~chaiwah/bifurcation.html for a bifurcation diagram). The first bifurcation of the logistic map occurs for a control parameter value of 3.0; for values ≤ 3.0, there is only one value for the long-term population, but for values of the control parameter >3.0, there are two values for the long-term population. Other bifurcations can be seen on the diagram.

(C) For some values of the control parameter, such as 3.6, it appears that the population never settles down to one or a few alternating values. Such populations are known as chaotic, and students may wish to search for chaotic values of the control parameter.

	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
④ From a bifurcation diagram, students examine the idea of self-similarity. In self-similarity, all of the bifurcations look essentially the same, except for the scale (i.e., the fork pattern looks the same for all bifurcations, if viewed closely). Bifurcation points are very important because at a bifurcation point, a small change of the control parameter can produce a marked change of population.	MATH 2, 3, 10	5, 10
⑤ The bifurcation diagram has a structure, which is known as a *fractal*—it looks like the same pattern over and over, but repeated on a smaller and smaller scale. Students make other fractals from programs that use self-similarity methods. Students may use programs that have been previously installed, or they may seek, download, and use programs from the Internet. Some programs for making fractals are FracTree, FractInt, and Fractal Explorer, which are all shareware available from several places on the Web. The user's manual for the TI-83 also includes a simple program to make a "Sierpinski Triangle," which is a fractal.	MATH 3, 10	4, 5, 6, 9

Tools and Resources

SOFTWARE:

- ▷ Spreadsheet

HARDWARE:

- ▷ Graphing calculators

WEB SITES:

Mathematics Archives:
http://archives.math.utk.edu/software.html

The Chaos Game:
http://math.bu.edu/DYSYS/applets/chaos-game.html

FractED:
www.ealnet.com/ealsoft/fracted.html

BOOK:

- ▷ Percival, I., & Richards, D. (1982). *Introduction to dynamics.* Cambridge, U.K.: Cambridge University Press.

Assessment

Evaluate students on their ability to:

- ▷ Correctly compute with and plot the models used
- ▷ Determine and explain stability of solutions
- ▷ Recognize bifurcations and the onset of chaos
- ▷ Recognize self-similarity

Credits

John Olive, University of Georgia, Athens
(jolive@coe.uga.edu)

Barney Ricca, Bishop Dunne High School, Dallas, Texas
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Comments

When examining various resources for use in this activity, we found that most sources connect (implicitly) the logistic equation to population models. Upon review of the underlying mathematics, we determined that the control parameters of interest in the logistic equation do not correspond to most population systems. (In essence, the regions of chaos apply only to systems whose unrestrained growth would be more than 200% in any single reproductive cycle.) However, looking at population still gives, we believe, the best entrée into this topic.

Lining Up Data

Mathematics

Secondary Grades 9–12

Purpose

In this activity, students:

- Examine the concept of functions (including graphs, domain, and range of interest) using real-world data
- Make models of data and predictions based on that data
- Discuss and defend their conclusions with other students
- Use a variety of resources to gather information
- Show that math can be used to synthesize data

Description

Students make predictions based on such real-world data as phone bills, postage rates, and airline schedules. Students use graphing calculators to plot data and draw lines that fit the data they have graphed. They then use these lines to make predictions that extrapolate or interpolate the data. Students conduct research to find other appropriate data sets, develop questions, and answer questions developed by other students.

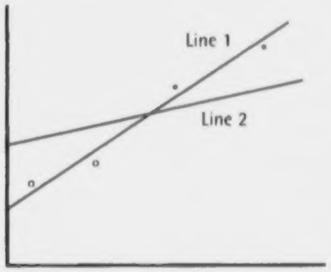
Activities

	MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
① Find appropriate introductory linear data sets and ask students to interpret (e.g., a long distance phone bill with several calls to the same number—record the length of the calls in minutes and the charge for each call). See the Web sites listed in Tools and Resources for possible data sets as well as local examples that students will find relevant.	MATH 5	
② Use the selected data set to demonstrate how data and graphing are connected. Students plot data on graphing calculators and choose appropriate "window ranges" to display the data. (In the example, the length of the call is plotted along the x-axis and the cost along the y-axis.)	MATH 10	5, 8
③ With the students, develop a mathematical model to fit the data, writing it in functional form. (Graphically, the data looks like a straight line, with every minute "costing" a certain amount of money. The connection between the algebraic and graphical representation of straight lines may be elicited here.)	MATH 2, 6	9
④ Students calculate the parameters of the model using the data, and display the model graphically along with the data. (Students will derive ideas such as "Since 5 minutes costs $2, each minute costs $0.40." Students learn to identify the meaning of their parameters, as in "slope is the cost/minute," or "the y-intercept is the connect charge.") TI-GraphLink can be used to copy the graphs from the calculator screen to a computer or printer.	MATH 1	5, 9

⑤ Students judge the model's "line of best fit" and adjust the model as necessary. By looking at their graphs, students can see how closely their model line comes to the data points. In addition, during the adjustments of their costs per minute and connection charges, students can come to understand the different effect of each parameter on the graph. (An extension of this discussion uses The Geometer's Sketchpad or Capri Geometry to show graphically the meaning of "least squares error.")

⑥ Students compare their fit with the fits of other students, discuss and defend their models and parameters, and develop a measure for the "goodness of fit." (Students will compare graphs and generally work toward deciding which graph is a better model of the data.)

For example, in the graph below, Line 1 is considered to be a better model of the data than Line 2.



⑦ Group students for an independent project that focuses on data sets and lines of best fit. Have students find other data sets from other sources such as the library, CD-ROMs, and the Internet. Using the data sets, follow the same procedure as in the previous activities. Have students develop questions based on these data sets, and then exchange both data sets and questions with other students. (Roughly linear data sets can be found in almost every newspaper; see Tools and Resources.)

MATH STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9-12
MATH 6	8
MATH 8	8, 10
MATH 5, 9, 10	7, 10

Tools and Resources

SOFTWARE:

- TI-GraphLink (freeware available from www.ti.com/calc/; cable must be purchased separately), The Geometer's Sketchpad (Key Curriculum Press) or Capri Geometry (Texas Instruments)

HARDWARE:

- Graphing calculators

WEB SITES:

- Sites offered through the Texas Instruments Web site:

  A Paraphrase of the Airline Schedules Investigation:
  www.ti.com/calc/docs/act/murdock04.htm

  Let Technology Help You "Experience Math"–Data Collection:
  www.ti.com/calc/docs/act/stan3.htm

  Bring Mathematics to Life–Pass the Book:
  www.ti.com/calc/docs/act/panke1.htm

  Bring Mathematics to Life–Spring Lab:
  www.ti.com/calc/docs/act/panke2.htm

BOOK:

- Murdock, J., Kamischke, E., & Kamischke, E. (1997). *Advanced algebra through data exploration.* Emeryville, CA: Key Curriculum Press.

OTHER:

- Other good (and roughly linear) data sets are house prices per square foot (taken from local real estate ads); minutes played versus goals scored (for hockey players); postage rates versus weight (taken from the USPS or shipping companies); height versus shoe size (this has a lot of scatter if you use adolescents); years of math education and average salary (fortunately, the slope is positive!); and flight time versus mileage data for airlines.

Assessment

At a minimum, evaluate students on their ability to:

- Plot data correctly
- Calculate lines of fit and to explain the significance of the parameters in their equation
- Explain and defend their choice of fit to other students

Develop a rubric with students for scoring the independent projects that aligns with the learning activity objectives. Students should be aware of and understand the scoring rubric at the beginning of the project. As the project progresses, students can help refine the various levels of the rubric.

Credits

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John Olive, University of Georgia, Athens
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Comments

Barney Ricca has used this activity with eighth and ninth graders who are just beginning algebra or physical science. A first data set that works well is a phone bill from a calling card (e.g., someone calling home from a conference). Having an entry for a single minute is helpful, because some students think that whatever the charge is for the first minute is the charge for every minute, and good discussion can ensue from that idea. Generally, this activity is used without ever mentioning "slope" or "intercept." Wait until students are proficient at their calculations and interpretations before introducing the vocabulary.

Science Learning Activities

Introduction	
PreK–2	Classifying Animals
PreK–2	Home Sweet Home
3–5	Who's Who in Fingerprinting
3–5	World Wide Weather
6–8	Bird Rap—A Web Guide to Local Birds
6–8	Earth Movement in Real Time
9–12	Acceleration
9–12	How Big Are We?

INTRODUCTION

Science Learning Activities

Technology has changed not only science, but also how scientists work. Observation, measurement, intervention, and even monitoring, diagnosis, and treatment rely extensively on technology. How we know about ourselves, our immediate surroundings, the global environment, and the universe is changing. How we interact with each other and our environment is changing. How we do science is changing. Therefore, how we study, learn about, and teach science must change to maintain relevance and effectiveness for future explorers, researchers, practitioners, and lifelong learners.

Discoveries such as new particles, new environmental trends, new mineral and energy deposits, new food-production strategies, new cosmic phenomena, and new relationships among lifestyles, genetics, and health have accelerated as a result of new and emerging technologies. Information that could only be gathered or researched at great cost in human and fiscal resources or with grave danger to human life or the environment only a decade ago is now readily available, and the sharing of that information is much more efficient. Collection and synthesis of data, which in the past often relied on extremely small samples, now uses new sensing, communications, statistical, reporting, and display technologies to more quickly provide reliable results.

Community-based projects, such as the National Geographic Society's famous acid rain initiative, enable students to learn science while doing science. Probeware, Internet and Web resources, sophisticated simulations, and online access to scientific expertise enable students to participate in science as never before. Both for its ability to engage students in doing and learning science as well as for its role in true scientific endeavor around the world and beyond, technology in science education is no longer just an option.

While a book such as this can only highlight a limited number of ideas at each grade range, the eight learning activities outlined in the following section serve as a catalyst for creative discourse and design as educators move to embrace this substantive revolution in the teaching and learning of science.

PREVIEW OF LEARNING ACTIVITIES

"Classifying Animals" and "Home Sweet Home" encourage early learners to develop keen observational, analysis, presentation, and communications skills as they compare and contrast animal attributes and habitats. A variety of technologies play an important role in these early scientific activities. Video camcorders aid observation; a computer assists in recording, tracking, and analyzing raw data; and multimedia-authoring/presentation software and a VCR support enhanced journaling as well as recording and reporting of results and new knowledge to a variety of audiences.

Teachers of Grades 3–5 who are challenged to address important science content and technology competencies simultaneously can draw on "Who's Who in Fingerprinting" to design an engaging student learning activity. In a mystery-solving environment, this activity uses community resources, online research, classification in analysis and problem solving, display of data through graphing, and other important skills and concepts to explore authentic identification techniques.

"World Wide Weather" is another learning activity that encourages cross-curricular connections within intermediate grades. Students collect, manage, and report authentic data, and then compare weather patterns and make projections about future conditions.

As students progress to the middle grades, autonomy increases for selecting and refining their own learning activities. "Bird Rap—A Web Guide to Local Birds" provides a framework in which students can refine their specific research based on preliminary investigations and contribute to a class Web-based field guide to birds.

"Earth Movement in Real Time" lets students examine current information on earthquakes. By using Web sites that monitor seismic activity, students are able to map global activity, make generalizations about the earth's crust, and derive conclusions about the changing nature of the earth.

"Acceleration" provides high school students with the opportunity to demonstrate their understanding of fundamental physics concepts (acceleration and velocity) by applying sophisticated technology.

The National Aeronautics and Space Administration (NASA) makes a wealth of space-related data available on the Web. "How Big Are We?" outlines one use of the NASA Web site to stimulate a rich and challenging learning activity. This lesson provides opportunities for students to work in small teams, just like practicing scientists.

Classifying Animals

Science

Primary Grades PreK–2

Purpose

This set of learning activities provides students with an experience in observing and classifying animals found at home and in zoos. As they increase vocabulary and critical-thinking skills, students will focus on the characteristics of animals, including adaptations.

Description

Most children have an affinity for animals as pets and imaginary creatures. Students begin by investigating the characteristics of their own pets as well as familiar ones in their neighborhood. They make a preliminary set of generalizations about the animals, thereby creating an initial classification system. Students then look at zoo animals, comparing their characteristics with the classification system developed. In the end, students are guided to the general scientific classification system.

Activities

PREPARATION

- ▷ Contact a local zoo to obtain resources for classroom use. Many zoos have kits of lesson plans, children's literature, and accompanying materials.
- ▷ Make arrangements for a field trip to the local zoo.
- ▷ Search the Web for sites depicting regional animals. Local zoos, humane societies, the SPCA, and animal parks may have Web sites and archives of materials for classroom use.
- ▷ Meet with the library media specialist to assist in planning. Determine available videos, software, and literature that will support the study of animals.

PROCEDURE	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK–2
① Students brainstorm all the pets in their homes and neighborhoods. List those pets on the board in writing, or with pictures, or both. Some students may be able to bring pictures of their pets to class. Create a chart based on the characteristics they describe. (Classifying by color is a typical first start that groups eventually abandon.) When the class has decided on a classification system, students record and illustrate the chart with example animals for each category.	*K–4 SCI A1, C1	1

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* *Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI A2, C3, E1).*

	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK–2
② VERTEBRATE INVESTIGATION: Obtain chicken bones that have been boiled, stripped, and cleaned. In small cooperative groups using skeletal drawings of a chicken, students attempt to identify the location of the bones they have been given. Have them focus on the legs (upper and lower), back and breast bones, wings, and ribs. (Head and feet bones are usually not provided with chickens bought in grocery stores.) Consider asking students to bring chicken bones to school for further identification. Discuss the purpose of the bone structure in the animal. Why are some bones thick or thin, short or long, curved or straight? Which bones seem to be missing? Point out the backbone and its structure. Tape the bones to cardboard or paper.	K–4 SCI A1, A2, C1	
③ INVERTEBRATE INVESTIGATION: Using a shoebox lid, place a mealworm in the lid for observation (or place one on an overhead projector for observation using the light. However, be careful: The can becomes very hot). Using a spoon and card, have students control where the mealworm goes. How many legs does it have? How many feelers? What is on its tail end? How many body segments are there? Use a magnifying glass to observe how the mealworm moves. The focus of this activity is the structure and lack of backbone in the mealworm. Among the many questions to ask while observing mealworms are: ▷ Does it move best on rough or smooth paper? ▷ After placing more mealworms in the box, how can students tell the difference between them? ▷ What food do mealworms like best? Cornflakes? Flour? Bread? Crackers? ▷ Do mealworms like moisture? How can students find out? ▷ Do mealworms like cold or warm places? ▷ Do they like light or dark?	K–4 SCI C1	1, 3
④ Ask students to bring a few of their favorite stuffed animals to school (be sure they are clearly labeled with owner's name). Discuss where students think the animals should be placed in their classification system. Differentiate between imaginary or stuffed animals and real animals. Use the Web sites for stuffed animals (see Tools and Resources) to look at the differences between real animals and stuffed animals. List differences between real and stuffed animals in the general information on the classification chart. (It is important that very young children recognize the difference between the two before proceeding with the lesson sequence.)	K–4 SCI A1, A2, CI, C3	10

	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES PREK–2
⑤ Connect with another classroom, either in the school or remotely through a keypals-matching project. Poll the other class's students about the types of animals they have in their homes and neighborhoods. Have the class place these new animals in their classification system. What does not fit? Why? Can the class explain why some categories seem to be very full? Alter the classification system, as needed.	K–4 SCI C1	1, 3, 10
⑥ Students brainstorm about animals they are aware of but do not have as pets. These animals might be those they have seen on television or in movies, and are too big or too small to keep as pets. Classify these animals according to the class's classification system. Use the Web sites to examine pictures of animals. Do additional alterations in the system need to be made? (By this time, students should be able to classify vertebrates as mammals, birds, reptiles, amphibians, or fishes.)	K–4 SCI C1	10
⑦ Use zoo Web sites or CD-ROMs on animals to examine more animals. As pictures of animals are obtained, students classify the animals, providing justification for why each animal fits in a given category. Students record their favorite new animal in each category in a science journal.	K–4 SCI C1	10
⑧ As students discuss the various characteristics of animals, consider inserting a minilesson on ways in which animals adapt to their environments. This is an important characteristic of each animal and one that should be an integral part of the upcoming zoo visit. Revisit the familiar animals that are on the classification list. Discuss adaptation by looking at commonalties and differences.	K–4 SCI C1, C3	9, 10
⑨ Plan a visit to the local zoo. As students visit the various exhibits, have them classify and record the animals on their chart. For younger children, this can be done with pictures or symbols. Take digital pictures of animals for the classification chart and as a record of the zoo visit. *Note: Some zoos are initiating electronic connection programs between school-aged children and scientists in the field. Ask the local zoo about such programs.*	K–4 SCI A1, A2, C1, C3	
⑩ Assign students to groups by classification area: ▷ Animals with backbones: mammals, birds, reptiles, amphibians, and fishes ▷ Animals without backbones: echinoderms (spiny skins), arthropods (jointed legs), mollusks (soft bodies), corals, and sponges ▷ With the assistance of an adult or cross-age mentor, have each group prepare a presentation on its category. The presentation should include the characteristics of the category, animals that fit the category (in various sizes), and selected animals that do not fit the category (and why).	2, 8	

Tools and Resources

SOFTWARE:

- Word-processing, multimedia-authoring, San Diego Zoo Presents: The Animals! (Mindscape)

WEB SITES:

Denver Zoo:
www.denverzoo.org/

Philadelphia Zoo:
www.phillyzoo.org/

Cleveland Metroparks Zoo:
www.clemetzoo.com/

San Diego Zoo:
www.sandiegozoo.org/

Los Angeles Zoo:
www.lazoo.org/

The Electronic Zoo:
http://netvet.wustl.edu/e-zoo.htm

- Related lesson sites:

Dakin:
www.applause.com/dakin.htm

Beanie Babies®:
www.beaniebabies.com/

How Big Was That Animal?:
www.fmnh.org/education/LOTguide3.htm

- For finding keypals/project partners:

epals Classroom Exchange:
www.epals.com/

Global Schoolhouse:
www.gsn.org/

Intercultural E-Mail Classroom Connections:
www.stolaf.edu/network/iecc/

Global Rigby:
www.reedbooks.com.au/rigby/global/keypal.html

Web66:
web66.coled.umn.edu/

Kids' Space Connection:
www.ks-connection.org/

Assessment

Given a set of cards that each depict an animal, students should be able to classify each animal as invertebrate or vertebrate (and within one sub-area of vertebrate).

Students should be able to use the scientific vocabulary appropriate to the grade level in describing animals.

Students should be able to describe some of the adaptive characteristics of specified animals, making conjectures about the adaptive behaviors of unfamiliar animals.

Multimedia presentations should be evaluated both on meeting the content standards as well as for clarity of presentation.

Credits

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Comments

Classification of animals is a skill that even PreK students are successful at when presented in multiple ways. I have found that the younger the children, the more likely they will be to focus on attributes that are common to many animals, making it difficult to separate the animals into categories. Once it becomes clear to them that attributes such as size and softness are not helpful, they seem to arrive easily at the vertebrate classifications. Introducing invertebrates has been difficult. The easiest have been worms and arthropods.

The technology has really made a difference in connecting classroom learning about classification to the zoo experience with exotic animals. This has been especially true as we have extended the lesson sequence into issues of adaptation. Being able to see the images of animals they visit, both in their zoo habitat over the Internet as well as in natural settings, has helped focus students' attention and increase their retention. Even with PreK students, the recording journal hung around their neck made the visit "more scientific" and valuable.

Notes:

Home Sweet Home

Science

Primary Grades PreK–2

Purpose

Young scientists learn from the world around them by observing habitats and their organisms and by recording data in scientific journals. Such exercises help develop the intellectual methods of scientific inquiry.

Description

Students enjoy investigating and becoming aware of the habitats around them. They record their observations in scientific journals. Data collection can take the form of a simple drawing or taking digital photos or videos in the habitats of their choice. Students reconstruct the facts in their journals, in an electronic format, or edit original recordings to share with other children and adults.

Activities

PREPARATION

- ▷ Identify safe areas around the school for student investigations.
- ▷ Plan with the media specialist and other curriculum resource personnel to gather software, books, videos, and laserdiscs on animals and their habitats.
- ▷ Explore resources outside the school that provide guest speakers such as zookeepers or animal owners.

PROCEDURE	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES PREK–2
① Create a scientist's journal for gathering data and observational notes. Each student makes his or her own by folding one piece of 8.5" x 11" construction paper in half and stapling several pieces of newsprint inside. Students should take an active role in constructing their journals. PreK and kindergarten students use their journals to hold drawings, cutout pictures, or electronically generated images.	*K–4 SCI A1, F4	2, 3, 4, 5
② Take the class out to observe a selected habitat. Conduct a silent nature walk through the area. Back in the classroom, ask students what they saw and have them list their observations on chart paper. Explain the importance of data collection and give an example, such as carefully watching the interaction between organisms. Use inquiry-based learning for students to discover habitats and the interaction of organisms.	K–4 SCI A1, C3, E3	2, 3, 4, 5
③ Give each team a piece of string 36" long. Send teams to a designated area on the school grounds and have each group place their string end-to-end to form a circle. The area inside the string is their "Circle of Life" habitat. Students quietly observe their habitat, writing or drawing their observations in their	K–4 SCI E3, F4	2, 3

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* *Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI A2, C3, E1).*

	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK-2
scientists' journals. Be sure to have them note the time, date, and temperature.		
Note: This activity can be conducted on the school campus, as a home or family activity, or even using a terrarium habitat in the classroom. The process is more important than the place.		
④ Record observations using a digital camera with a macro lens. A digital camera or video camcorder with a good zoom function can greatly enhance this activity, especially for disabled children who might not be able to get on the ground to observe the habitat. Recording the observation also serves as a good reference for students.	K-4 SCI A1, A2, E3	1
⑤ Use word-processing software to create a class list of attributes for students to compare and contrast. Compare and contrast data gathered from a second observation at a different time of day.	K-4 SCI C1, C3	9
⑥ Using multimedia-authoring or Web page creation software, students replicate the observed habitat. They may animate their electronic habitat to duplicate their observations. Students use the software's text function to describe the habitats.	K-4 SCI A1, A2	8
⑦ Have each team present their electronic habitat. After each presentation, conduct a discussion focused on the attributes of the observed habitat. Students compare and contrast the different attributes of each habitat by making a Venn diagram on chart paper.	K-4 SCI A1, A2, C1, C3, E3	4, 8, 10
⑧ Record the presentations using a video camcorder so that parents and others can view the presentations. If the team has used multimedia-authoring software that produces card-style printouts, print the cards four to a page and make a minibook to send home to parents, with the videotape.		5, 9
⑨ Follow up the lesson by introducing Acorn Pond from Sammy's Science House (Edmark). Prompt students to use the same observational skills with the software as they did outside.		2, 7
Extension: Send the teams to observe their habitats at different times of the day to compare and contrast their observations. How is the habitat different after it has absorbed direct sunlight for a few hours?	K-4 SCI A2, C3	3, 4

Tools and Resources

SOFTWARE:

- ▷ Kid Pix Studio, HyperStudio, Web Workshop, Sammy's Science House (Edmark)

HARDWARE:

- ▷ Digital camera, video camcorder, VCR

WEB SITES:

Kathy Schrock's Guide for Educators:
http://discoveryschool.com/schrockguide/

Webs of Life:
http://muohio.edu/dragonfly/webs/

InTech 2000 Forum (includes lesson plans):
http://intech2000.miamisci.org/

Assessment

Before the lesson, have students draw or list all they know about habitats in the first pages of their scientists' journals. After their presentations, have students list or draw what they learned about habitats on the last pages of their journals. Teacher observation and student-generated rubrics are beneficial in assessing this project. The specific science concepts assessed should align with the district and state standards and be used as a planning guide. The pre and post drawings should be prompted by questions that elicit the desired feedback based on the identified science content standards.

Credits

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Heidi B. Rogers, Coordinator, New Century Classroom, University of Idaho, Coeur d'Alene, Idaho
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Comments

Students were amazed to see how many organisms lived interdependently in a small circular habitat. One group of students was quietly observing their habitat outside the cafeteria when a raccoon jumped out of a garbage can! Their presentation later included an animated raccoon running across the page.

Parents enjoyed viewing the projects on video. This project also works well with homebound children.

This lesson is a wonderful addition to units on homes, communities, families, and animals.

Notes:

Who's Who in Fingerprinting

Science

Intermediate Grades 3–5

Purpose

Through this learning activity, students will focus on science as inquiry by:

- Researching
- Gathering and analyzing information
- Using a variety of technological and information resources
- Collaborating with classroom and global peers to investigate the scientific basis and impact of fingerprints as well as technological innovations in human identification

Description

Students work together in teams to learn about fingerprinting as an identification method. They analyze, compare, contrast, and classify characteristics of their fingerprint styles with those of their peers (e.g., whorl, accidental), creating a class graph from the results. Students use their new knowledge to create a series of scenarios about a lost object on which they find partial fingerprints. Using the identification characteristics, students make conjectures about who the culprit is, eventually proving their theory through analysis.

Activities

PREPARATION

- Arrange for a local law enforcement agent to visit the class and show students how fingerprints are taken, analyzed, and shared through technology.
- Examine two Web sites: FBI Kid's and Youth Educational Page to ensure that they meet students' needs (see Tools and Resources). Additional sites may also cover fingerprint analysis.

SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5

PROCEDURE

① As a class, introduce the idea and use of fingerprints. Complete an overview of the unit, describing the end products and the expected levels of achievement in terms of a tentative rubric. Include both a timeline and behavioral expectations.

② Students work in teams (approximately four per team) to fingerprint each other. To make a fingerprint: (1) use a graphite pencil to make a swatch of "ink" on a piece of paper, (2) have a student press a finger on the graphite and then press that finger onto the sticky side of a piece of cellophane tape, and (3) stick the tape onto a piece of paper for analysis.

	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
③ Scan, enlarge, and print digital images of student fingerprints for classroom display and analysis. While taking the fingerprints, provide information on the rationale and development of the fingerprinting process. Check the FBI's Web site; its activities periodically change. If appropriate, use an online activity with students.	*5–8 SCI A1	1, 5, 9
④ Students create a class graph based on their own fingerprint characteristics. Be sure to debrief the class on the graph's results and present generalizations based on the graph.	K–4 SCI A1	5, 7, 9
⑤ When completed fingerprints are displayed, discuss the characteristics students see in the prints. Record their observations in a prominent place. Assign groups to research the legally described characteristics of fingerprints. Invite an expert from the local law enforcement agency to discuss the use of fingerprints in investigations. Groups research the historical development of fingerprinting and the reasons for its widespread use.	K–4 SCI F5	7, 8
⑥ In groups, students identify their own fingerprint characteristics. Students should be able to describe the fingerprints of the group in terms of the prints' characteristics.	K–4 SCI A1	
⑦ Have each team identify one person in the group who has lost an item. Write a scenario describing how the evidence contains partial fingerprints from the owner. (Caution: Review the groups' identifications of culprits, being sensitive to how "suspects" might perceive their roles.)	K–4 SCI A1 5–8 SCI A1, C1	1, 5
⑧ Have each fingerprint mystery solved by another group. Each group must provide a justification for its solution and any concerns it has about misidentifying the culprit. The fingerprint should be identified according to the characteristics learned by the class.	K–4 SCI A1	5, 9
⑨ Post scenarios and findings on the Web for other classes to investigate.	K–4 SCI A1	7
⑩ For further analysis, ask the students: ▷ Can fingerprints be altered? ▷ How are fingerprints used in electronic identification? ▷ Have you seen touch pads used for identification as part of a story in a movie? Do they really exist?		

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* *Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI A2, C3, E1).*

Tools and Resources

SOFTWARE:

- Word-processing, spreadsheet, graphing

HARDWARE:

- Scanner

WEB SITE:

FBI Kid's and Youth Educational Page:
www.fbi.gov/kids/kids.htm

Search engines such as HotBot (www.hotbot.com/) to generate general lists of fingerprint sites

Assessment

The teacher can evaluate the students individually on:

- A written analysis that explains the team graph
- Their ability to work cooperatively in groups and assimilate knowledge
- Their predictions about whether all seven fingerprint characteristics will be represented in the classroom
- Their ability to identify fingerprint characteristics

The teacher can evaluate the student teams on their ability to sort the fingerprint classifications observed within their groups.

Credits

Jane Gorder Jefferson Elementary School, Spokane, Washington
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Paul Tarantiles Montclair School District, Flemington, New Jersey
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Comments

At first, one of our biggest concerns was the fingerprint scenario. We worried that students could become labeled or have their feelings hurt by being identified by a group as a "culprit." To solve this problem, we asked for student volunteers to place their names in a box if they were willing to be the subject of a hunt. This made the exercise fun for the students who chose to volunteer.

Notes:

World Wide Weather

Science

Intermediate Grades 3–5

Purpose

Students begin to understand that weather is different all over the world. Students explore the causes of weather patterns, noting how weather in one location helps predict weather in related areas.

Description

Teams of students study, chart, and write about the weather and its effects on a particular city, for the month. The team constructs a multimedia presentation of its findings. The class constructs a final project that uses and merges the teams' findings to demonstrate weather patterns around the world.

Activities

PREPARATION

- ▷ Arrange for class speakers: radio or TV meteorologists or members of local weather clubs.
- ▷ Gather resources (books, maps, multimedia CDs, weather videos, Internet sites).
- ▷ Prepare a KWL (know, want to know, learned) chart to assess student knowledge.
- ▷ At the beginning of each day, identify the probable weather concepts, technology skills, and topics to be covered (e.g., weather vocabulary, graphing concepts from a spreadsheet). Gather the appropiate resources for exploring the daily concept.

PROCEDURE	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
① As a class, establish the project's guidelines or elements: for example, a graph of precipitation, temperatures (high and low), description of typical weather for the current season, adaptations people make based on current weather, and generalizations of weather patterns for an average year.	*K–4 SCI D3 K–4 SCI G1 5–8 SCI G1	
② Group the class into teams, by continents. Assign each individual a role within each group (weather reporter, multimedia gatherer, chart producer, or journal recorder). Rotate the jobs every week to allow all students to experience each job. (If time allows, consider having students make their own weather instruments!)		
③ Ensure that team members understand their roles and responsibilities for the first week of data collection.		
▷ The weather reporter and chart producer find and chart each day's high and low temperatures, wind speed, amount of precipitation in their selected city, as well as produce weekly graphs.	K–4 SCI C3	1, 3 4, 5, 6, 7, 9, 10
▷ The multimedia gatherer looks for photographs, QuickTime movies, and weather maps that describe the weather of the city during the week, saving the items in a specially marked folder or disk.	5–8 SCI C4	1, 4, 7, 10

• Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI A2, C3, E1).

	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
▷ The journal recorder keeps a daily record of the group's activities and the effects of the weather on the city's inhabitants. If possible, the recorder will also communicate by e-mail with a person or class from the city. To find out how and where to connect with other classes (see Tools and Resources).	K–4 SCI G1 5–8 SCI G1	1, 3–10
④ Conduct a class session on generalizations from the data collected thus far. Be sure to emphasize correct vocabulary and term usage.	K–4 SCI C8, D3	
⑤ Help the groups reach conclusions about the weather patterns for the month. Periodic status checks are helpful as groups report on their findings each week. As the groups accumulate more data, encourage them to compare their findings from one week to the next. Group the cities by location, tracking the weather from one location to the next. Encourage students to make generalizations about how the weather in one location may predict weather elsewhere as winds and currents travel in a given direction.		
⑥ After four weeks of data collection, teams construct multimedia presentations or Web pages that include the findings on the weather patterns for their selected cities and the effects of the weather for that month. Multimedia presentations must include facts about each city's weather, charts and graphs, and timely weather maps. The effects of the weather on the people living in the cities must also be included.	5–8 SCI C4	1, 3–10
⑦ Following group presentations, conduct a debriefing session on trends and generalizations that are apparent in the data. To stimulate the discussion, use weather sites on the Internet to show current video tracking of weather around the globe. The class constructs a final multimedia project that includes all of the cities studied.	K–4 SCI B5	

Tools and Resources

SOFTWARE:

- ▷ Multimedia-authoring or presentation

WEB SITES:

- ▷ For finding weather information:

The Weather Channel:
www.weather.com/homepage.html

USA Today's Weather Page:
www.usatoday.com/weather/wfront.htm

CNN Weather:
www.cnn.com/weather/

Weather Underground:
www.wunderground.com/

Dan's Wild Wild Weather Page (a television meteorologist's interactive site):
www.whnt19.com/kidwx/

weatherOnline:
www.weatheronline.com/

Note: The National Weather Service (NWS) has sites all over the nation. Most NWS sites have clickable maps. See, for example, Weather Connections (http://nwselp.epcc.edu/elp/wxconn.html), the NWS site for El Paso, Texas.

- ▷ For finding keypals/project partners:

epals Classroom Exchange:
www.epals.com/

Global Schoolhouse:
www.gsn.org/

Intercultural E-Mail Classroom Connections:
www.stolaf.edu/network/iecc/

Global Rigby:
www.reedbooks.com.au/rigby/global/keypal.html

Web66:
http:/web66.coled.umn.edu/

Kids' Space Connection:
www.ks-connection.org/

OTHER:

- ▷ Daily newspapers, TV access in the classroom or at home

Assessment

Group multimedia projects can be scored on a rubric based on the criteria presented for the elements of the project. Teams can be assessed by their weekly charts and journals. The criteria in the rubric depends on the students' scientific background and can be set based on district, state, and national guidelines, as well as students' personal goals for learning.

Using the class's final project, students can write a paragraph that describes the differences and similarities they see between each city's weather. In addition, students can write general descriptions about weather patterns they have observed.

Credits

Paul Tarantiles, Montclair School District, Flemington, New Jersey (ptarantiles@montclair.k12.nj.us)

Jane Gorder, Jefferson Elementary School, Spokane, Washington (janeg@sd81.k12.wa.us)

Comments

Several teachers in our district have used this learning activity as an ongoing project with weather as a social studies or multidisciplinary unit that includes a substantial geography component. Daily connections with a city gives students a sense of their own location's weather as they make comparisons with other cities. Coupled with other units of instruction, the project makes local weather come alive!

Students from other countries have been especially interested in this project. In searching the Internet for information, these students have been able to find weather or city sites for their native regions, in their own languages. For example, Mikato, a fifth grader from Japan, had a rough transition to his new school and neighborhood. The climate of his new area was much warmer than he was used to, and he did not have access to the same seasonal sports. By participating in the weather study, he not only tracked and translated the weather for his group, he taught students weather terms in Japanese! The connectivity enabled Mikato to collaborate with students in his old school and begin a weekly weather comparison. Because the weather in Japan is reported in Celsius, his American classmates learned how to convert to Fahrenheit in order to understand and report measurements for their partners.

Bird Rap—A Web Guide to Local Birds

Science

Middle Grades 6–8

Purpose

Students identify 20 or more different species of local birds by their behavior, shape, song, color, habitat, and food requirements. Students apply this research in assessing the local status and health of wild bird species.

Students will:

- Conduct research using several technological resources to gather and synthesize information
- Collaborate with peers to compare, contrast, and analyze their research
- Use a variety of technological tools to create and present a product

Description

Students will:

- Create a Web page field guide to the birds of their community
- Work in groups to research the characteristics and lifestyles of different local birds and share their findings (1) with each other and (2) on a Web page field guide with middle school classrooms via Internet links
- Research local songbirds' physical characteristics (structure and function), their behavioral and environmental adaptations, as well as their population status through the use of scientific experts, field guides, video clips, CD-ROMs, scanned print resources, and related Web sites
- Observe, record, videotape, and photograph local songbirds and their behaviors
- Create a Web page field guide to local birds
- Give a class presentation and post their research on the Internet

Activities

PREPARATION

- Arrange for online mentors (see Tools and Resources).
- Obtain a copy of *Peterson's Field Guide to Birds.*
- Meet with the school librarian or media center teacher to find school site resources that support students' research.
- Obtain a list of local songbirds from the local Audubon Society.
- Meet with the school Webmaster to schedule posting of student work on the school Web page.

PROCEDURE

	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
① As a group activity, complete a "know, want to know, learned" (KWL) chart on students' knowledge of local songbird populations. Use concept-mapping software to create flowcharts or concept maps for research tasks. Outline the objectives of the final project; include required components of the Web page (see Assessment).	*5–8 SCI A1	4, 7, 8, 9
② Group students in teams of four. Assign the following primary tasks to each team member. Rotate tasks daily. ▷ Manager: Collects all materials needed for investigation and is the only team member who can communicate with other teams. ▷ Tracker: Keeps group on-task, reviews procedures, and manages time. ▷ Data Processor: Enters and retrieves information using the computer. ▷ Principal Investigator: Leads activity and is the only team member who can communicate with the teacher.	5–8 SCI A1, F2	
③ At the first group meeting, have each group select a different local songbird. Group members collaboratively outline the research tasks, including the following: songs and calls; habitat, physical characteristics, and adaptations; reproductive and mating behaviors; role in local food web; migration patterns (winter, summer, and breeding ranges); population dynamics; and ecological health. Use a database to keep track of information and to compare results.	5–8 SCI A1, C3, C4, C5	5, 8
④ As research progresses, team members collaborate in creating Web-page storyboards for their field guide by incorporating script, graphics, transitions, special effects, and other available tools. Throughout the process, students pose questions, seek explanations, find additional resources, and edit their products.	5–8 SCI A1	1, 2, 3, 6, 7, 8, 9
⑤ Each group presents its Web-page component of the field guide to the class or another group (e.g., the local Audubon chapter) or both, using a computer video-presentation system.	5–8 SCI A1	6, 7
⑥ As a whole, the class collaborates with other in- and out-of-state middle school classes over the Internet to create a scientific "telecommunity." (See Tools and Resources for making connections with other classrooms.) Within this framework, students can compare, evaluate, read, share, investigate, and debate each other's avian research.	5–8 SCI A1, C1	6, 7, 10

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* *Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI A2, C3, E1).*

Tools and Resources

SOFTWARE:

- Word-processing, graphing, graphics, video-production, Web page creation, concept-mapping
- About birds: Birds of North America (Thayer Birding Software), Jr. Nature Guide Series—Birds (Forest Technologies), Peterson Multimedia Guides: North American Birds (Houghton Mifflin Interactive)

HARDWARE:

- Video camcorder, video-presentation system, digital camera, scanner

WEB SITES:

- For information on birds:

  Classroom BirdWatch:
  http://birdsource.cornell.edu/cfw/

  Aves.net:
  http://aves.net/the-owl/blnkview.htm

  USGS Patuxent Wildlife Research Center (includes North American Breeding Bird Survey):
  www.mbr.nbs.gov/bbs/bbs.html

  Jason Project:
  www.jasonproject.org/

  FNO The Subject Index (an index to research and information problem-solving sites):
  www.fromnowon.org/fnoindex.html

- For finding keypals/project partners:

  epals Classroom Exchange:
  www.epals.com/

  Global Schoolhouse:
  www.gsn.org/

  Intercultural E-Mail Classroom Connections:
  www.stolaf.edu/network/iecc/

  Global Rigby:
  www.reedbooks.com.au/rigby/global/keypal.html

  Web66:
  http:/web66.coled.umn.edu/

  Kids' Space Connection:
  www.ks-connection.org/

OTHER:

- Library reference print materials, binoculars or spotting scopes, online references and mentors

Assessment

Students and teachers can generate a separate scoring rubric for both the Web page and the presentation. The Web page should include all of the following:

- Title
- Appropriate photos, scanned images, digital photos, or video of specific wild birds
- Appropriate sounds depicting songs and calls
- Graphics depicting field marks, behavior, habitat, and ranges
- Graphs of current populations and health trends
- Six paragraphs illustrating bird-specific natural history and current avian issues
- Five links to other related avian Web sites
- One hyperlink to another Grade 6–8 class (preferably out-of-state)

The groups will debrief and do self-assessment on their daily progress.

Use peer evaluation for final assessment of all group members.

Credits

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Debbie Silver, Louisiana Tech University, Ruston, Louisiana
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Comments

We used this activity as the basis for one of our thematic units. The opportunities for interdisciplinary instruction are limitless, especially when you have staff willing to support your science instruction. We did! The art teacher helped with Web-page design and bird photography, the language arts teacher helped with the narratives, the math teacher helped the students put their data into graphs, and the science teacher helped guide the biological explorations. Next year we plan to add videos of some alternative assessments that the students developed (e.g., bird collages, bird stories, an informational tape about bird songs, and a skit about bird adaptations).

The parents really got involved in this activity. They enjoyed being able to go to the Web site and see their children's work. Several students commented that when parents saw what other groups did, they encouraged their own children to improve their products. It was a great way to engage the parents' interest as well as that of the students.

Earth Movement in Real Time

Science

Middle Grades 6–8

Purpose

Students collect current data, much as scientists do, to make generalizations and conjectures about the location of the earth's tectonic plates while exploring the nature of the earth's dynamic crust. The access to current data and instant maps in an environment of collaborative learning places students in a simulated scientific research setting.

Description

Students access current information on earthquakes that have recently taken place around the world. Data is collected over a period of time that, when graphed and mapped, will crudely show the boundaries between the earth's tectonic plates. Students work in collaborative groups, exploring various geological formations around the world, monitoring earthquake and volcanic activity. The collection, recording, and analysis of the data will produce generalizations and conclusions about the changing nature of the earth.

Activities

Activities	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
① Assign students to groups with five to seven members, divided according to the regions of the area being studied. If the focus of the curriculum is the continental United States, then assign groups on the basis of the regions of the U.S. Otherwise, assign groups as distributed around the world, ensuring that all oceans and continents are covered. Students access the USGS earthquake Web site and look at recent activity in their area (see Tools and Resources).	*5–8 SCI A1, A2	3, 7
② Students plot the longitude and latitude of regionally selected earthquakes on a physiographic map. (Various physiographic maps are available on the Internet, by geographic area.)	5–8 SCI D1, E2	7
③ Students map both active and inactive volcanoes around the world using the same process as in (1) and (2) above. What is the relationship between active volcanoes and locations of the tectonic plates? What is the relationship to earthquakes?	5–8 SCI D1, D3	

Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI A2, C3, E1).

	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6-8
④ Check the sites weekly for recent data. After a few weeks, compare the locations of the earthquakes with the location of the tectonic plate boundaries. Keep all statistical data on sites. Plot a graph to show changes. How do the locations of the earthquakes relate to the location of the tectonic boundaries?	5-8 SCI A2, E2	3, 7
⑤ As the student groups collect weekly information about their areas, study the background and effects of earthquakes. Use an Internet search engine to find more information about earthquakes and volcanoes. Has an earthquake ever occurred in the students' area? Look at great earthquakes of the past. When and where have they occurred? How does this information relate to tectonic activity in those areas?	5-8 SCI D1, E2	3, 7
⑥ Do a minilesson on the structure of a volcano, including the dynamics of how volcanoes erupt. Explore the sites related to the active volcanoes in Hawaii. Use the photos to increase comprehension about the structure and nature of volcanoes.	5-8 SCI D3, E2	4
⑦ Students prepare multimedia presentations on their studies of their geographic areas. By providing a general format for the presentations, link the presentations together as a single worldwide (or nationwide) presentation.	5-8 SCI E2	5, 6, 8
⑧ Use the class's set of presentations to piece together information about active areas of the world and how these areas relate to one another. Discuss the dynamic nature of the earth's crust.	5-8 SCI A1	

Tools and Resources

SOFTWARE:

- ▷ Word-processing, spreadsheet, graphing

WEB SITES:

USGS National Earthquake Information Center:
http://geology.usgs.gov/quake.shtml

Volcano World:
http://volcano.und.nodak.edu/

Volcano Gallery:
http://volcanogallery.com/volcano_steamvent.htm

Hawaii Volcanoes National Park:
www.hawaii.volcanoes.national-park.com/how.htm

Assessment

Students should be assessed not only on the generalizations they make, but also on their ability to succinctly and accurately convey the information about their geographic area. Before assigning the multimedia presentation, clearly outline the expectations for the presentation, including format and content. Because the content objectives should align with the grade-level objectives, specific objectives and assessment guidelines are not provided here. However, a scoring rubric should be created for the multimedia presentation that includes the degree to which content objectives and other lesson objectives are met.

Credit

Adapted from Slattery, W., Handley, S., Finagan-Stoll, C., & Becker, M. (1998, September). Collecting science in a net: How lesson plans from the World Wide Web facilitate science education. *Learning & Leading with Technology, 26,* 25–30.

Comments

The quality of maps and information available on the USGS Web site is always a surprise to students. They hear about earthquakes taking place somewhere around the world but generally do not take the information seriously unless there is one in California. The USGS site brings the reality of the dynamic nature of the earth's crust alive as students realize they are working with current data. Recently, students in an Algebra I class decided to use their data collection to develop an equation that would predict when volcanoes in their region would erupt. That's doing real science!

Notes:

Acceleration

Science

Secondary Grades 9–12

Purpose

This learning activity provides a follow-up activity for students to:

- ▷ Apply their understanding of positive and negative acceleration and positive and negative velocity by finding examples of each
- ▷ Embed appropriate hyperlinks in a presentation
- ▷ Share their results with peers

Description

These activities follow a study of acceleration and velocity. Students design a Web page that includes examples of each of the following: (1) positive and negative acceleration, (2) zero acceleration, and (3) positive and negative velocity.

A basic rubric is presented at the beginning of the learning activity to help students define the scope of the Web-page project. The students will identify at least three appropriate Web sites that demonstrate the use of acceleration in each of the acceleration and velocity situations listed above.

The Web page should integrate sound, scanned pictures, motion pictures, and digital camera images to convey the uses of acceleration as well as provide an avenue of expression for multiple learning styles.

The students evaluate themselves using a rubric they synthesize with the teacher at the beginning of the activity.

Activities

Note: The bulk of this assignment is designed to last three days, but it can be easily modified to fit other schedules.

	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
PREPARATION	*9–12 SCI G1, G2	7, 10

PREPARATION

Break the class into groups of four students each. The groups will each produce a Web page that consists of various resources that show examples of acceleration in our world. Within each group, a student will play a different role each day.

- ▷ Leader: This person is in charge of the direction of the group.
- ▷ Cheerleader: This person will support the group.
- ▷ Worker: This person is the only one who can touch the computer.
- ▷ Questioner: This person is the only one who can discuss the project with the teacher.

** Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI A2, C3, E1).*

	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9-12
DAY 1		
▷ Introduce the assignment. Assign groups to brainstorm ideas for the acceleration Webfolio (a Web version of a portfolio). Students look for Web sites that pertain to the five different types of Web sites needed (see Assessment).	9-12 SCI B2, B4, E1, E2	2, 5, 9
▷ Using spreadsheet software such as Excel, students create a set of data in which the graph shows one of the types of acceleration/velocity requested (see Assessment). Students make graphs for each type of acceleration or velocity.	9-12 SCI A1, B4	5, 8
DAY 2		
▷ If students have problems finding data on the previous day, use the Internet to find numbers dealing with acceleration and chart them using four of the five options. Find sound clips, take and modify pictures, and download movie clips for integration into the Webfolio.	9-12 SCI G2	5, 10
DAY 3		
▷ In their own words, students develop a purpose statement for the assignment. Have students include this on the Web page. Enhance the design of the Web page, developing the background and themes. Students write four paragraphs describing what has been learned. Review all work, check to be sure all objectives have been met, complete final revisions, and save the final product on the network.	9-12 SCI G1, G2	2, 4, 5, 7, 8, 10
DAY 4		
▷ Hold group presentations of the Webfolios and grade them. Be sure to note that group/peer evaluations count toward the grade.		2, 6

Tools and Resources

SOFTWARE:

- Web page creation, spreadsheet, presentation

WEB SITE:

Webfolio information:
www.cesa8.kwi.us/it/webfolios.htm

Assessment

Assessment can consist of a rubric developed by the students and teacher before the Webfolio is started. The rubric can include all assessible aspects of the portfolio as well as a group rubric with which students may grade one another.

Each Webfolio can include the following elements:

① Title

② Purpose statement

③ Fifteen links to Web sites that fall into the following categories. (Before its listed hyperlink, each Web site will have a small paragraph summary that evaluates the Web site's rationale.)

- Positive acceleration–positive velocity
- Negative acceleration–positive velocity
- Positive acceleration–negative velocity
- Negative acceleration–negative velocity
- Zero acceleration–positive/negative velocity

④ Four graphs that explain four of the five concepts below:

- Positive acceleration–positive velocity
- Negative acceleration–positive velocity
- Positive acceleration–negative velocity
- Negative acceleration–negative velocity
- Zero acceleration–positive/negative velocity

⑤ An appropriate sound that has to do with velocity, acceleration, and their uses

⑥ An appropriate scanned or digital camera image concerning acceleration and its uses

⑦ An appropriate motion movie concerning acceleration

⑧ A spreadsheet charting some interesting acceleration data derived from a Web page

⑨ Four paragraphs explaining what the student has learned about acceleration

⑩ Conclusion

Credits

Scott Kirst, Oconto Falls High School, Green Bay, Wisconsin
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Comments

Students who have used this portfolio have remarked that it is easy to be creative. The students do not have a set goal: They just develop their own. With the students developing the rubric, they can help evaluate each other's documents. This requires the teacher to do little or no coercion; instead, a student-centered classroom develops in which growth can occur. The Webfolio model is easy to learn and can be integrated into virtually any unit with which the teacher is comfortable. Remember, during this lesson the students must do all of the work; the teacher is available only for guidance and crowd control. Discuss problems only with the Questioner and do not answer questions unless you have determined that the students have exhausted all possible independent solutions. Above all, students must lead the lesson. It is wonderful to have a student teach something the teacher does not know: Imitation is the highest form of flattery!

How Big Are We?

Science

Secondary Grades 9–12

Purpose

It is important that students evaluate the size and scope of the universe as well as analyze the complexity and nature of astronomy. This complexity can be synthesized through the abstract concept of mass estimation and the concrete concept of dark matter.

Description

Through research on the Internet, students create a way to estimate the number of galaxies in the universe, stars in the galaxies, and the average mass of a star. In the end, the data collection and interacting with primary research data enables them to estimate the visible mass of the universe.

Note: To set the stage for this activity, consider having students conduct several Web site scavenger hunts to find astronomy-related Web sites.

Activities

	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
① Group students in twos or threes. Instruct the groups to develop a plan to estimate the number of visible galaxies in the universe. Introduce them to the NASA Web site as a place to begin their search for ideas (see Tools and Resources). Have the groups share their methods and results.	*9–12 SCI A1, A2, D1, D2, G1	1, 2, 7, 8
② Preview the series of activities that follow, paying special attention to the final project—the multimedia presentation. As a class, brainstorm the elements of a rubric for assessment purposes. This rubric guides the students' perception of what is expected of them throughout the learning activity. Be amenable to student-suggested modifications in the rubric before assigning the final project.		
③ After the students estimate the number of galaxies in the visible universe, change the task to developing a plan to estimate the average number of stars in a typical galaxy. Again, the NASA Web site is an excellent place to begin their search. Consider changing the method of reporting from oral to written, or post various formats that use the talents of many students in the group.	9–12 SCI A1, A2, D1, D2, G1	1, 2, 7, 8
④ After students estimate the number of stars in a galaxy, students find the approximate mass of an average star. This could be researched through traditional methods, but the information is also available on the NASA Web site. Focus on the method for finding the approximate mass of an average star. Debrief this task in terms of the work that scientists do and how recording procedures are important to the task's outcome and replicability.	9–12 SCI B2, B3, B4	7

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* *Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI A2, C3, E1).*

	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9-12
⑤ Using the information they have discovered in the exercises, students approximate the experimental error in their calculations, with 5% to 25% being an acceptable range. Students should spend time discussing why a number as high as 25% is acceptable.	9-12 SCI B2, B3, B4	7
⑥ Using this information, students determine the mass of the universe by simply multiplying all of their answers together. Encourage students to come to this conclusion on their own and have them justify why their method is appropriate. Again, the groups should approximate the experimental error.	9-12 SCI D4	8
⑦ Have the groups incorporate the results of their searches into a presentation not exceeding five minutes. Along with students, assess the presentation using the jointly created and modified rubric.	9-12 SCI G2	4
⑧ Average and compare the answers to the mass of the universe question. The theoretical answer can be found on the NASA Web site. This is usually updated monthly. Have students draw conclusions about the necessity of changing information and the comparison of their results with the current posting on the Web site.	9-12 SCI G2	10
⑨ As an extension of this learning activity, introduce the exploration modules in Astronomy Village (NASA Classroom of the Future). This software utilizes NASA resources to explore related problems in astronomy.		

Tools and Resources

SOFTWARE:

- Presentation, spreadsheet, Astronomy Village: Investigating the Universe (NASA Classroom of the Future)

WEB SITES:

NASA:
www.nasa.gov/

NASA CORE (Central Operation of Resources for Educators):
http://core.nasa.gov/

Assessment

Assessment can be through a rubric developed jointly with the students. Characteristics should include:

- Quality of overall work
- Quality of explanations, recordings, notetaking
- Analysis of numbers
- Creativity of presentation skills
- Effective and appropriate use of the Internet

Credits

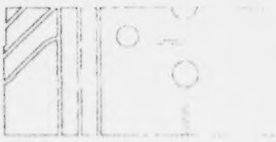
Scott Kirst, Oconto Falls High School, Green Bay, Wisconsin
(skirst@ocontofalls.kwi.us)

Comments

This series of activities addresses many standards other than those in the curriculum areas of science and technology.

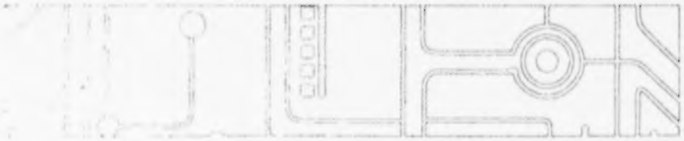
By using intuitive thinking and the Internet, students are able to develop a number that is thought to be one of the toughest concepts in astronomy and cosmology. This can be extremely rewarding for students who often feel they are just doing work someone else has already done. This activity is a perfect transition to the subject of dark matter, discussed to some extent in cosmology. A more thorough definition and analysis can be found on the NASA Web site. Although the site is comprehensive, the data does change. The search engine provided at NASA is effective and makes related information easy to find. In facilitating this lesson, remember not to give hints or guidance to Web sites beyond NASA. The students may struggle a bit, but they will remember the search pattern later.

Notes:



Social Studies Learning Activities

- Introduction
- PreK–2 Celebrating Our Nation's Diversity
- PreK–2 Postc@rds from the Net
- 3–5 Navigating by Landmarks
- 3–5 You Want to Sell Me What? The Many Forms of Advertising
- 6–8 Into the Next Millennium
- 6–8 Walk in My Shoes
- 9–12 Commemoration of the Gettysburg Battlefield: The Gettysburg Address
- 9–12 Population Growth and Urban Planning



INTRODUCTION

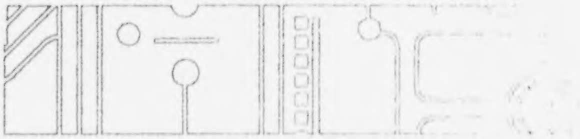
Social Studies Learning Activities

The dominant social, economic, cultural, and scientific trends that have defined the Western world for five centuries are rapidly evolving in new directions. The 21st century will bring us face-to-face with the information-electronic-biotechnological age. Issues, new and old, will become more complex worldwide as people interact more rapidly, vividly, and easily using modern technology. It is critically important that the possibilities and responsibilities accompanying the use of technology are recognized and that our schools provide students with equitable opportunities to apply these technology resources as they learn to be productive citizens in today's interdependent society.

Social studies in America's schools provides core knowledge and ways of thinking drawn from many academic disciplines, and creates opportunities for students to develop informed, reasoned perspectives on societal issues. It also engenders active participation in civic and community life. The leading professional organization in the field, the National Council for the Social Studies (NCSS), has adopted this definition of social studies:

> Social studies is the integrated study of the social sciences and humanities to promote civic competence. Within the school program, social studies provides coordinated, systematic study drawing upon such disciplines as anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and natural sciences. The primary purpose of social studies is to help young people develop the ability to make informed and reasoned decisions for the public good as citizens of a culturally diverse, democratic society in an interdependent world.
>
> (National Council for the Social Studies. (1994). *Expectations of excellence: Curriculum standards for social studies* (p. vii). Washington, D.C.: Author.)

The learning activities included in this section address the NCSS thematic standards and utilize technology tools to support learning goals related to the NCSS curriculum standards for students of all ages. They are intended to provide a broad overview, not an in-depth perspective, modeling how technology can be integrated in meaningful ways. Educators are encouraged to adapt the content, activities, and methodologies found in these lessons to address other social studies curriculum areas, individual student needs, and/or classroom settings.



PREVIEW OF LEARNING ACTIVITIES

Classroom use of technology to support social studies content standards takes a variety of forms. At the PreK–2 level, "Celebrating Our Nation's Diversity" and "Postc@rds from the Net" encourage young children to use:

- "Interactive living books," videotapes, digital cameras, and interactive CDs to explore the worlds of children from other lands and cultures
- Electronic drawing/writing programs to illustrate their own culture, local, state and national symbols, festivals, holidays, and communities
- Internet resources for investigating and communicating with children in other towns, states, countries, and cultures

Elementary students quickly move to higher levels of technology use in "Navigating by Landmarks" and "You Want to Sell Me What?" This occurs through the use of:

- Specialized graph programs to illustrate population trends, products, and opinions
- Multimedia-authoring and presentation software to produce their own presentations of information, illustrations, and maps of states and countries
- Word-processing, database, and spreadsheet software to construct products that address people, places, events, innovations, or issues
- Specialized software for building timelines, constructing communities, collaborative problem-solving, and using historical databases and maps
- Internet resources for research, analysis, collaboration, and communication between individuals of different cultures, time zones, and places

Middle school students and secondary students apply standard productivity tools (e.g., database, spreadsheet, drawing, and painting software) in sophisticated ways to track trends, make predictions, evaluate data, and create illustrations that are applied in real-world situations to solve real-world problems. The Internet becomes a vehicle for collecting and exchanging information, verifying information, and exploring ideas and cultures through communications with content experts and students from other countries. Multimedia-authoring software, integrated productivity software, and graphing calculators become the tools for analyzing and illustrating data, information, diagrams, and graphics collected through research on countries, economies, trends, and issues. Collaborative projects using a variety of technology tools for content learning address the need for individuals to cooperatively solve problems and generate strategies for addressing public issues.

Celebrating Our Nation's Diversity

Social Studies

Primary Grades PreK–2

Purpose

Through the use of a real-world experience, students communicate in a variety of ways, and retrieve, organize, and synthesize data to develop an understanding of diversity. Students develop an understanding of what a census is, why it is conducted, and the procedure for doing so.

Description

In this lesson, students conduct a class census to measure diversity. The lesson is aimed at having a discussion of the key concepts associated with diversity and then writing or drawing about current impressions, thoughts, observations, and questions before looking at actual statistical data.

Note: Depending on developmental level and technology experience, students may need parental or volunteer assistance to complete tasks.

Activities	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK–2
① Using a globe, point out various countries and discuss their location in relation to the United States. Facilitate a discussion about the definition and concept of a country, differences and commonalties, including ancestors and heritage. In an effort to help students find out about their own heritage, assign e-mail interviews or telephone interviews with older relatives. Students should document their findings in print or electronic journals. Refer to the Our Diverse Nation and Vocabulary Toolbox Web sites for some discussion ideas (see Tools and Resources). Use graphing software to represent locations of ancestors and living relatives.	I, II, III	1, 2, 9
② As the activity progresses, have students gain an appreciation for obtaining factual information about the United States using a Census Bureau Web site. Have students identify the racial and ethnic groups represented in their class; the country or countries where their parents, grandparents, and great grandparents were born; their own birth place; and what language(s) are spoken at home. Keep lists or drawings of information for discussion.	I, II, IV	2, 3, 9, 10
③ Discuss the information collected in the last activity in light of measuring conclusions and testing the accuracy of the census data collection. Focus the discussion by dividing the class into four groups. With the assistance of parent helpers (if needed) assign each group a topic centered around the theme of diversity-ethnicity, ancestry, language spoken at home, or the students' place of birth. Each group can develop several questions centered on their assigned topic.	IV	5, 9

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES PREK-2
④ Each group examines actual questions asked by the Census Bureau in the 1990 Census, using the sample questionnaire found on the Census Bureau Web site. Some students may want to use the sample questions to guide the development of their own forms (using any word-processing software). Using questions similar to the sample questions will make it easier for students to compare their answers with those from the 1990 Census. Ask younger students to draw pictures of their families and grandparents. Some students may need to probe back to great-great grandparents to discover their ancestry. Have students design the questionnaire such that it helps them identify their ancestry.	IV	2, 3, 5, 6, 7, 9, 10
⑤ Students present the questions they have developed to the rest of the class. As a group, help students develop a format for their questionnaire to create a class questionnaire. Students determine if they will put their names on the queries, how they will keep track of the questionnaires, and what they will do about missing forms. Each group member can take his or her questionnaire home. Adults may need to help complete the forms.	IV, V	
Extension: Students create additional questionnaires for their families, another classroom, the rest of the school, and/or another part of the community. The students can add additional questions to their queries to find out other information about their classmates and families. Require the students to include instructions on the document, such as when and where it should be returned. Writing directions is a valuable exercise!	IV	
⑥ Collect all questionnaires. Each group can enter data into a teacher-made database that has fields corresponding to the questionnaire. Students use graphing software to create graphs representing their group's census information. Have the group analyze individual data, then collaborative group data. The whole class analyzes, compares, and contrasts all data collected. Students may post a questionnaire on the class Web site to collect data from other classrooms in the school, then compare that data.	I, IX	5, 6, 7, 9, 10

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK–2
⑦ When the census questionnaires have been completed, students summarize and present the information in various forms. Discuss the diversity of the United States. As a class, explore the pictures in the CQC's (Census Questionnaire Content Bulletins) and note how the 1990 Census data is presented. Using the CQC's, explain to students the differences between information displayed in tables, pie charts, and various bar graphs. Discuss the scales, the parts of the tables such as the stubs and headers, map legends, and ranked items. The level and age of students will dictate the amount of detail the students will comprehend. Have each student create a graph of their ancestral country of origin, comparing his/her family to the class profile. (Later, this graph will be imported into a multimedia stack.) Students write about the data presented in their print or electronic journals, and write and talk about the results of their census. Do they believe that most students in the class have similar or different ancestries? Students reread some of their previous journal entries. Do their present findings confirm or refute their original thoughts about the diversity of the class? Encourage students to write their impressions about the process of reporting data and what they found. Have them publish these results in a school newspaper using word-processing software.	I, II, IV, IX	2, 5. 6, 7, 9, 10
⑧ Each group creates a multimedia presentation based on the information collected on the assigned theme. Each presentation should contain at least one graph, one digital image, and a short paragraph describing family ancestry. Groups use digital cameras to take pictures of living relatives or have parent helpers scan pictures of ancestors. Import graphs made earlier into the stack.	I, II, III, IV, V, IX	4–9
⑨ Students hold an international festival that includes native food, dress, literature, music, and multimedia presentations. Students write about the festival and the information they have learned about the countries of their ancestors and other countries. Students share some of their journal entries with the rest of the class and then create a class book entitled *Our Diverse Classroom* using desktop-publishing software. Students can contribute portions of their journals and pictures of their families to the book. The book might also include the class census results, graphs, and tables. Publish the book on the class Web site so that it can be shared with diverse audiences.		4, 6, 7
Extension: Invite other classes, the whole school, and/or the local community to the festival. Establish pen pals with students in other countries and across the United States. Invite civic leaders and others to visit the class to speak about their race and ancestry.		4, 6, 7, 10

Tools and Resources

SOFTWARE:

- Multimedia-authoring (e.g., HyperStudio), desktop-publishing or word-processing (e.g., AppleWorks, Easy Book) or any software for recording in electronic journals, publishing class books, or creating school newspapers; Web page creation; graphing (e.g., Tabletop, Graph Club, GraphPower)

HARDWARE:

- Digital cameras, scanners

WEB SITES:

Census Questionnaire Content Bulletins (CQC):
www.census.gov/ftp/pub/edu/diversity/materials.html

Sample Questionnaire:
www.census.gov/ftp/pub/edu/diversity/quest.html

Census Bureau, 1990:
www.census.gov/ftp/pub/edu/diversity/quest/

Our Diverse Nation:
www.census.gov/ftp/pub/edu/diversity/divtext.html

Vocabulary Toolbox:
www.census.gov/ftp/pub/edu/diversity/l1ele.html

- For finding keypals/project partners:

epals Classroom Exchange:
www.epals.com/

Global Schoolhouse:
www.gsn.org/

Intercultural E-Mail Classroom Connections:
www.stolaf.edu/network/iecc/

Global Rigby:
www.reedbooks.com.au/rigby/global/keypal.html

Web66:
http://web66.coled.umn.edu/

Kids' Space Connection:
www.ks-connection.org/

Assessment

The teacher can take anecdotal records while observing students throughout each activity and create rubrics to evaluate the electronic or print journals, graphs, multimedia presentations, and group presentations.

Credits

Sheryl Abshire, Calcasieu Parish School System, Lake Charles, Lousiana
(sabshire@hal.calc.k12.la.us)

Shannon McCoy, Jenks Southeast Elementary, Jenks, Oklahoma
(mccoys@jenksusa.k12.ok.us)

Comments

We have found that the classroom is the perfect place to discuss issues of diversity and equity. By being a part of the U.S. Census in 2000, our students will have the opportunity to learn through a real-world experience. Students use what they have learned by conducting a class census and by being a part of the U.S. Census, thereby developing respect for diverse cultures and their place in society.

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Notes:

Postc@rds from the Net

Social Studies

Primary Grades PreK–2

Purpose

Students develop an appreciation of the community in which they live, taking a closer look at the world just outside their doors and sharing their experiences with their classmates, near and far.

Description

Using familiar community locations or landmarks, students take an in-depth look at the unique characteristics and value of their community. They share their insights with their classmates and the worldwide community, working with a helper to create a postcard about their community to send to others.

Note: This activity can take place in both the fall and spring in order to compare and contrast the community environment in different seasons.

Activities

PREPARATION

- ▷ Organize resources, both print and electronic. Set up a classroom center focused on the children's "community."
- ▷ Identify an older elementary class or adult volunteers to serve as partners for the younger children.
- ▷ Create one or more model tag board postcards and electronic postcards.

PROCEDURE	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK–2
① Show original video or digital film clips of locations in the community. Use class discussion to generate a list of familiar locations. Begin with places such as the mall, the bank, the school, the grocery store, the dentist's office, a neighbor's house, or even students' homes. Provide students with the opportunity to view the video again by setting-up a VCR station for independent use.	III	1, 2
② Using a tag board model, lead a large group discussion on the correct format for postcards then model an example of a completed electronic postcard. In groups of three (and one helper), students create and critique miniature storyboards using index cards that they will turn into postcards. With assistance from the helper, groups proofread and edit their storyboards.	III	9, 10
③ Using the oversized tag board postcard as reference, students design their own postcard about a community landmark or other local spot. On the left half of one side of the card, students write about the place or landmark. On the right half of the same side, students address the postcard to another child in another classroom in the same school. On the reverse side of the card, students illustrate their selected location.	IV	
④ Students deliver their tag board postcards.	III	

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES PreK-2
⑤ Students create an electronic form of their postcard using ClarisWorks for Kids, Kid Pix Studio, or any other desktop-publishing software, and digital cameras. Students e-mail their postcards to other classrooms, school districts, parents, and keypals.	IX	1, 5, 6, 10
⑥ With assistance from a helper, students use mapping software to create a neighborhood map depicting each place or landmark's location. Younger children need to use a map template created by the teacher or other developmentally appropriate mapping software. Using the copy/paste function, demonstrate reproducing elements of the electronic postcard.	III	9
⑦ Help each student present and discuss their electronic postcard. Have the class present their neighborhood maps to parents and selected classrooms at a "Postc@rds from the Net" premiere performance.		5, 7, 8
⑧ As a culminating activity, take the class on a field trip to each location identified in the postcards. Take a class picture at each spot using a digital camera. Upon return, have students describe their trip in electronic journals. Journal entries and digital postcards can be posted on a class Web site to elicit responses from online discussion groups.	III	1, 5, 6, 7

Tools and Resources

SOFTWARE:

- Desktop-publishing (e.g., ClarisWorks for Kids, AppleWorks, Kid Pix Studio, Kid Works), mapping (e.g., Neighborhood Map Machine by Tom Snyder)

HARDWARE:

- Digital camera

WEB SITES:

Jan Brett's Home Page:
www.janbrett.com/

Arthur—Choose a Postcard:
www.pbs.org/wgbh/arthur/arthur/postcards/index.html

Kathy Schrock's Guide for Educators:
http://discoveryschool.com/schrockguide/assess.html

Neighborhood Map Machine:
www.diskovery.com/EPG/Products/Software/3464.html

- For finding keypals/project partners:

epals Classroom Exchange:
www.epals.com/

Global Schoolhouse:
www.gsn.org/

Intercultural E-Mail Classroom Connections:
www.stolaf.edu/network/iecc/

Global Rigby:
www.reedbooks.com.au/rigby/global/keypal.html

Web66:
http://web66.coled.umn.edu/

Kids' Space Connection:
www.ks-connection.org/

OTHER:

- Index cards

Assessment

Use a rubric to evaluate the electronic and traditional postcards. Student presentations can be assessed using a performance rubric (see http://discoveryschool.com/schrockguide/assess.html).

Credits

Sheryl Abshire, Calcasieu Parish School System, Lake Charles, Lousiana (sabshire@hal.calc.k12.la.us)

Shannon McCoy, Jenks Southeast Elementary, Jenks, Oklahoma (mccoys@jenksusa.k12.ok.us)

Comments

Postc@rds from the Net turned out to be a great art and geography lesson. Students worked hard making their pictures realistic and balanced on the page with interesting features such as the sky and people. Peer mentors and parent volunteers were excellent resources, helping younger children work with the hardware. Mentors and volunteers ensured that the children stayed on-task and focused on the objective of the lesson rather than getting hung-up on the technology.

Navigating by Landmarks

Social Studies

Intermediate Grades 3–5

Purpose

Students examine and apply the relationship between concrete landmarks, abstract written directions, and graphic representations on maps, and then develop their own landmark map for classroom use.

Description

In this lesson, students:

- ▷ Describe their route to school and the landmarks by which they navigate
- ▷ Write explicit directions (third graders may need to draw maps with simple directions and/or work with adult/peer partners)
- ▷ Create a multimedia map based on their written descriptions
- ▷ Compare their own written directions and maps to printed city maps, as well as the MapQuest Web site (see Tools and Resources)

Activities

PREPARATION

- ▷ Preview the MapQuest Web site. Create both directions and maps.
- ▷ Locate local map Web sites, such as the Chamber of Commerce.
- ▷ Assemble necessary technology tools.
- ▷ Gather a selection of local and city maps.

PROCEDURE	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
① As a class, discuss how finding your way from one place to another is called "navigating." Examples to discuss might include navigating across the ocean using stars, or up to the moon in a spacecraft using instruments. Discuss new navigational technology and its effect on exploration in space. Relate navigation principles to how students navigate when they travel to and from school every day.	III	
② Brainstorm and record on chart paper or electronically a list of landmarks students use to guide them to and from school, such as street signs, familiar houses, or stores.	IV	4
③ As a homework assignment, invite students to explore their trips to school and make notes about the landmarks they pass. Encourage students to be explicit when describing each landmark, as well as what they do when they get to it (e.g., turn right at the big yellow house with the white picket fence).	III	4

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3-5
④ As a class, discuss how each student's notes on landmarks will be used to create a written set of directions. The written directions will begin the moment students walk out the door of their homes and end with their arrival at school. (Practice with a set of directions to and from the playground.) When writing directions, students should be explicit about: ▷ What landmarks they see ▷ What action they take when they reach a landmark (such as, turn left just past it) ▷ Where they walk, such as on a sidewalk or across a park	III, VII	1, 4
⑤ Working individually, students use their written directions to create multimedia maps that include landmarks they have identified. Encourage students to use the drawing software to represent the landmarks as accurately as possible. Students can then add multimedia elements to the map in the form of buttons that correspond to landmarks. Elements might include a photograph showing a landmark in more detail or an audio recording of the name of the landmark and a brief description.	III	5
⑥ Taking turns with partners, students use the MapQuest Web site to create and print out maps and written directions from their homes to school.	III, IV	6, 7
⑦ Taking turns with partners, have one student try to follow his or her partner's map while listening to the directions. Then, partners follow each other's written directions using a map created on the MapQuest Web site. Do the same with a printed local map. Finally, students compare the written instructions accompanying the MapQuest map with their own map's instructions.	III	9, 10
⑧ As a class, discuss comparisons of the map types. Topics for discussion might include: ▷ What is the best map for this purpose? ▷ What other purposes might other maps be better for?	VII	9, 10
⑨ As a culminating activity, students set up their multimedia maps at kiosk stations in a computer lab or as rotating exhibits on a classroom computer. Let students and guests tour and explore the finished products. Consider having students create a scavenger hunt around school based on their maps. This activity will help demonstrate student learning for the guests.	III, IV	4, 5, 8
Extension: Using mapping software, have pairs of students design a town. Where is the school? What buildings, parks, and other things might the children in the town use as landmarks on their trips to school?	III	8

Tools and Resources

SOFTWARE:

- Computers with audio recording capability, word-processing, multimedia-authoring, mapping (e.g., MapMaker Toolkit, Neighborhood Map Machine)

WEB SITES:

MapQuest:
www.mapquest.com/

Cartography by Hammond, Inc.:
http://192.41.39.25/hammond20.html

National Geographic:
www.nationalgeographic.com/

Assessment

Assess student multimedia maps using a rubric jointly created by the teacher and the students.

Assess student understanding of the relationship between the student-created maps, the printed maps, and the MapQuest maps, either through brief written journal entries or individual student-teacher conferences. Criteria for an informal assessment might include:

- Sufficiency of detail
- Use of landmarks as opposed to cardinal directions
- Different ways to get to the same place
- Different scale and perspective
- Conceptual understanding
- Efficient and effective use of the MapQuest Web site
- Degree to which maps are based on landmarks

Use the same criteria above to informally assess group understanding of the relationship among the map types (as expressed in the group discussion). The ongoing informal assessment might lead to another learning activity on cardinal directions and scale maps.

Credits

Steve Cowdrey, Cherry Creek School District, Englewood, Colorado
(scowdrey@mail.ccsd.k12.co.us)

Melissa Pierson, Arizona State University, Tempe, Arizona
(mpierson@asu.edu)

Based on the lesson by Tom Burnett, Apple Learning Interchange
(www.ali.apple.com/)

Comments

For a group of teachers in San Marcos, California, this project provided a sense of orientation to the community. They found that many of the students were new enough to the area that they did not have much sense of where things were, relative to one another. Since there had recently been a major brush fire in the area that closed off streets, having to give directions for alternate routes to specific locations was fresh in their minds.

You Want to Sell Me What? The Many Forms of Advertising

Social Studies

Intermediate Grades 3–5

Purpose

Through this learning activity, students:

- Understand advertising and the role it plays in the marketplace
- Discover the ways in which the attributes of various media contribute to the effectiveness of advertising for a particular audience
- Become discriminating consumers of advertising strategies

Description

This learning activity takes place over an extended period of time and explores the purpose of advertising mediums. As a class, students examine advertisements using focus questions to determine their attributes, audience, and influences. In small groups organized by media type, students use focus questions to research one media type. Groups then present their findings to the whole class using presentation software. Small groups meet again to design and produce an advertisement in their researched medium. They also conduct a market analysis, including the cost of placing their ads. Finally, they present their ad to the whole class using the focus questions for discussion.

Activities

PREPARATION

- Gather samples of advertisements in various media forms: newspapers, magazines, radio and television recordings, and Web sites.
- Preview relevant media-related Web sites.
- Assemble and troubleshoot necessary technology tools. (See Tools and Resources.)
- Schedule a guest speaker who is either involved in advertising or uses advertising extensively to promote his or her business.
- Schedule adult helpers or cross-age tutors to assist younger children with group activities.

PROCEDURE

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
① As a class, discuss the purpose of advertising:	IV	
▷ How do advertisements influence the way you act on needs and wants?		
▷ How does fact and opinion play a part in advertising?		
② As a class, study one advertisement from at least three media types (choose from: newspaper, magazine, radio, television, and the Web). Discuss the following focus questions:	VII	6
▷ How does the ad make you feel?		
▷ Were you persuaded to buy the product?		
▷ What do you think the purpose of the ad is?		
▷ Who do you think is the target audience?		
▷ What ad components were effective?		
▷ Was this a product that you need or that you want?		
▷ Why is this medium effective for this particular ad?		
③ In small groups, students research advertisements found in various types of media. Each group works with one of the following: newspaper, magazine, radio, television, or the Web.	VII	6–10
④ Each group chooses a representative advertisement in their medium and discusses the attributes of the ad, using the list of focus questions.	I, II, III, IV, VII	
⑤ Using presentation software, each group presents the results of their analysis to the class. As a class, discuss the similarities and differences among the media types, and their perceived strengths and weaknesses. Determine why a particular media type was used for a particular target audience.	VII	5
⑥ Small groups meet again to design an advertisement for a product of their choice, for the media they have been working with. The group chooses a particular audience to which they will advertise the product, focusing on how consumers in this particular group can best be reached by the attributes of this media.	I, II VI	4, 5, 9, 10

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
⑦ Small groups perform market research on their advertisement by soliciting opinions from their peers in a focus group setting. (Creating research questions that can be numerically analyzed is a valuable mathematics task.) How students ask questions about the product will define how the results are reported. (Use a rating scale? Comparison with other like products? Attributes of product? etc.) Market research begins by sharing ads with other groups in the class, other students at school, family members, or others in the local community. Students can then create a graph of their research results, using spreadsheet or graphing software.	I, VII	4
⑧ After refining their advertisement, student groups use the Web to find representative groups from their target audience, experts in the advertising field, or others with knowledge about their product. Students electronically send their advertisements to these groups for further comment.	I, VII	6
⑨ Small groups investigate the cost of placing their advertisements in the media by contacting newspapers, magazines, and radio and television stations, or by researching the costs of advertising on the Web. Discuss the impact of easy access to the Web. Do a cost/benefit analysis comparing advertising costs with potential profits.	VII	6, 9, 10
⑩ Small groups use electronic presentation software to present their final advertisement to the class, along with the results of their market research and cost/benefit analysis.		5
⑪ As a group, have the class reflect on the results of the small group work, discussing which media is most cost-effective for different audiences and purposes.	VII	9
⑫ Further topics of discussion may include: ▷ Consumer spending habits of different population groups ▷ How personal choices may affect the economy ▷ How local advertisements compare with nationally run advertisements	I, II, III, IV, VII	4

Tools and Resources

SOFTWARE:

- Word-processing, presentation, spreadsheet or graphing, video-editing

HARDWARE:

- Audiotape player, video camcorder

WEB SITES:

Newspapers:
www.denverpost.com/
www.nytimes.com/
www.latimes.com/

Magazines:
www.time.com/
www.usnews.com/usnews/home.htm
http://pathfinder.com/people/
www.zdnet.com/

Radio Stations:
www.broadcast.com/radio/

TV Commercials:
www.malcolmdesigns.com/hwtvcom.html
www.buckmans.com/tvcommercials.htm
www.przyborski.com/com_list.html

OTHER:

- Newspapers, magazines, recordings of radio and television advertisements, World Wide Web advertisements (found on almost any commercial Web site)

Assessment

Develop a scoring rubric to evaluate each group advertisement. As the assignment develops, share the rubric with the class. Be sure to adjust the rubric based on appropriate student suggestions. Students use the rubric to evaluate their group advertisement. Give samples of advertisements in various media and have students discuss the ad in terms of the beginning focus questions.

Credits

Steve Cowdrey, Cherry Creek School District, Englewood, Colorado
(scowdrey@mail.ccsd.k12.co.us)

Melissa Pierson, Arizona State University, Tempe, Arizona
(mpierson@asu.edu)

Comments

Many teachers have found that the combination of group and individual work in this learning activity works well in meeting the needs of all students. This is especially true for classrooms where there are second-language learners. Nuances in the words used in advertising can be deceiving to second-language learners. The group work helps take care of finding the many grammatical and spelling errors that used to show up in final projects. The use of the new technology has made this project much more successful than when conventional tools were used. Students are always pleased with the professional-looking results.

Notes:

Into the Next Millennium

Social Studies

Middle Grades 6–8

Purpose

"Into the Next Millennium" develops a major concept of time. The main purpose of this learning activity is to put world history in perspective, utilizing a variety of visual resources in combination with textual historical information to give readers a global view of happenings in widely separated parts of the world. Student developed projects using new technologies of networked multimedia and the Internet enable students to use a constructivist approach along with a technology focus to re-create a global sense of time.

Description

Students are asked to develop a project that demonstrates their knowledge of an overview of time, dating from the ancient world to the 20th century, eventually projecting to the 21st and 22nd centuries. The project requires:

- ▷ Researching three major time-related categories (people, places, and events) using resources available to students, accessed via a variety of indices (maps, timelines, and digitized archives of documents)
- ▷ Narrowing down a topic from one of the major categories and tracking its evolution, from origin to the present
- ▷ Synthesizing and recording material in order to create a sequence
- ▷ Projecting into the next millennium to predict change
- ▷ Producing an evaluated presentation product that shares information with an audience

This project utilizes an Internet resource that provides a synchronoptic history chart and a digital timeline using visual art forms (maps, graphics, and colors) in combination with historical information. (Synchronoptical means "seeing at the same time." A synchronoptic chart enables the viewer to see many things at the same time.)

Activities

PREPARATION

- ▷ This set of activities should occur after students have a geographical and historical overview of the eastern and western hemispheres. General knowledge of cultural, historical, and political aspects of the world would be helpful, but not necessary. Timelines and chronology dating from recorded history to the 20th century should be introduced to explain the concept of B.C. and A.D. Students should then be directed to a variety of Web chronologies and timelines. Books, software, Internet resources, and videos should be made available and organized in stations for easy access.

  Note: When developing their project, students should be proficient with presentation software (e.g., PowerPoint, HyperStudio), and/or Web page creation software. E-mailed interviews to scientists online and local resources are ideal tools to help students project into the next millennium. Web conferencing with other individuals with comparable technology, to obtain information from field experts, can enhance student learning. Virtual reality enhancements produced by QuickTime sites can encourage futuristic thinking as students make predictions about change. For instance, if a student chooses "famous people," he or she can actually conduct an e-mail interview with an astronaut and virtually interview Leonardo da Vinci, and so on. (See Tools and Resources.)

200

PROCEDURE

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6-8
① Students assess and become familiar with the Web site: HyperHistory Online in a group setting with teacher direction using a projection system or lab setting (see Tools and Resources). After demonstration and discussion, students decide which of the three major category groups (people, places, or events) they are interested in joining.	II	2, 4, 7
② In these groups, students individually decide on a topic of focus within their major category (art, music, literature, politics, wars, religion, economy, etc.) that they will trace throughout history. At this time, students can decide ways to reveal their future predictions of change as it relates to their topic (e.g., have the audience help with predictions and produce a hands-on facsimile of their topic using digital images, etc.).	II, III, V, VI, VII	2, 4, 7
Students should be encouraged to choose high interest and/or strength-based categories in the following lists of focus topics, or suggest their own. For example, if four students in the "people" group love music, they could trace the origin of musical instruments, dances, types of music, or musicians. One member of the group could trace clothing design trends while another could research famous leaders, and so on. Students can then form subgroups to decide collectively how each of the topics will evolve in the next millennium.	II, III	2, 4, 7

SOCIAL STUDIES STANDARDS

NETS PERFORMANCE INDICATORS GRADES 6–8

PEOPLE

Each student picks one topic, or aspect, to trace from its origin:

- Cultures and their recorded contributions to civilization
- Origin of food crops
- Artists and art forms
- Composers and music
- Actors and theatre
- Clothing and fashion trends
- Famous leaders

PLACES

Each student picks one topic, or aspect, to trace from its origin:

- Origin of cities
- Origin of maps
- Famous cities
- Famous buildings
- Architecture and dwellings
- Landforms

EVENTS

Each student picks one topic, or aspect, to trace from its origin:

- Wars and their causes throughout history
- Inventions and inventors
- Money and the evolution of economics
- Writing and communication
- Education and schools
- Careers and occupations
- Transportation

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
③ After students have chosen their category, have the group discuss the specific strand each student will research and which technology mode they will use to share their information, collectively or individually, with an audience. In addition, have each group decide which aspects they want to emphasize and which decades they want to focus on. Each student can assume a role in the constructing, sharing, and disseminating of information. Students should be encouraged to use a variety of technology hardware and software to complete the product. For example, if students pick topics that correlate well, such as money and education, they may produce their material simultaneously.	II, III	5, 10
④ Utilizing Web sites, books, CD-ROMs, and periodicals within station settings, students can record their findings on paper, in sequential order, from origin to the present, in either a storyboard or journal note-taking form. Students can keep an ongoing electronic file of Web sites and CD resources.	II, III	5, 10
⑤ Collectively, have students decide which technologies they will use to produce their final product. Encourage them to use multiple technologies and to enhance their presentations in interesting ways (e.g., they can dress in costume, perform, bring food, invite a guest, etc.). As students project changes into the next millennium, they should decide how far they want to project (e.g., 100 years, 1,000 years, etc.). For example, if they choose to track computers, they could envision and create tiny devices that could be connected to humans, then actually demonstrate their usefulness with 3-D imaging, and so on.		5, 6, 8, 10

Note: Cooperative groups should be given ample time to create, plan, and practice their final product. Journals and charts should be created to help guide them.

Tools and Resources

SOFTWARE:

- Presentation (e.g., HyperStudio, PowerPoint, Digital Chisel), word-processing (e.g., ClarisWorks, Microsoft Word), multimedia-encyclopedia

HARDWARE:

- Scanner, digital camera, video camcorder, TV/VCR, QT-VTR

WEB SITES:

HyperHistory Online—Over 1,400 Files Covering 3,000 Years of World History:
www.hyperhistory.com/online_n2/History_n2/main.html

American History Archive Explorer:
www.ilt.columbia.edu/k12/history/aha.html

Seeds of Change—Where Do Food Crops Originate?:
www.nmnh.si.edu/garden/history/welcome.html

Explorations in Economic Demand:
http://ecedweb.unomaha.edu/Dem_Sup/demand.htm

Romantic Chronology—Web Chronologies and Timelines:
http://humanitas.ucsb.edu/projects/pack/rom-chrono/others.htm

People, Places, and Events—Examples from 15,000,000 B.C.–1999:
www.geocities.com/~mohan_iyer/dateline.htm

AlternaTime—Timelines on the Web:
www.canisius.edu/~emeryg/time.html

OTHER:

- Encyclopedias, textbooks/books

Assessment

Students and teachers can produce a rubric to evaluate presentation products (HyperStudio, PowerPoint, and Web page creation). Students and teachers can also produce a rubric to evaluate organization of and cooperation in group work. Written notes and journals can be periodically checked for clarity and consistency.

Credits

Vivian Meiers, Northridge Elementary School, Bismark, North Dakota
(vmeiers@btigate.com)

Comments

Students have created HyperStudio presentations tracing events from 1920 to 1998. Pairs of students were instructed to include text, animation, sound, graphics, and video onto three cards to depict their story. Research and planning occurred before they went to the computer, so they worked from a preplanned paper storyboard. When they were finished, they presented their story with TV projection, taking turns with the script. Students brought props, such as hula hoops and records, and demonstrated dances and fashion. They had a blast and learned about many historical events along the way.

Walk in My Shoes

Social Studies

Middle Grades 6–8

Purpose

Through this learning activity, students:

- Examine how history, culture, and geography influence a person's perception of a particular place
- Construct a historical knowledge base of conflicts in the Middle East by immersing themselves in the role of individuals who live there
- Research and analyze how historical, geographic, and cultural factors influence the views of various groups of people found in the Middle East
- Apply what they have learned concerning the Middle East and technology, and create a multimedia presentation for the class

Description

Assuming the role of a Palestinian, Jew, or Briton, students explore how their assigned group felt about Israel during the time of the formation of the Israeli state. Students research the viewpoints of the Palestinians, the Jews, and the Britons, synthesize the information, and then create a multimedia diary from the group's point of view. A fourth group investigates feelings of people today about the conflict in the Middle East. This group creates a multimedia diary representing all three points of view. Presentations are delivered to the whole class and followed up with discussion and debate.

Activities

PREPARATION

- Begin the lesson sequence with a background study of Middle Eastern physical and political geography. Students should become familiar with culture, current events, and the history of the region.
- Organize books, software, and Internet resources for the project into easily accessible station areas.
- Identify local resources and people who might be interviewed for the project.

Note: This learning activity can be adapted to examine conflicts in American history (e.g., slavery in America). To help make Web searches more efficient, provide a reference list of suggested Web sites (see Tools and Resources).

PROCEDURE	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6–8
① Divide the class into four small groups. Groups should each have access to the Internet and multimedia computer stations. Students share the responsibility of researching, analyzing, and presenting their information. Assign specific roles to individuals within the groups to ensure consistency and accuracy of the information gathered and products developed. Groups 1–3 are assigned either the role of Palestinians, Jews, or Britons during the time of the formation of the Israeli state. Group 4 is asked to investigate feelings about the conflict in the Middle East (past and present) held by people from many cultures living in the U.S. today.		7

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 6-8
② Each group bases its investigation on a similar set of research questions. (See the following examples.) Group 4 investigates the perspectives of all three groups—Palestinians, Jews, and Britons—today. ▷ What impressions and opinions did Palestinians, Jews, and Britons have about the geographic area occupied by Israel? ▷ What role does religion play in the conflict? ▷ What was each group's attitude toward Israel? (See Tools and Resources for relevant search topics.) ▷ What justification did each group have for attitudes and actions it took? Other issues that may be linked to the investigation: ▷ Could Israel have been located somewhere else? ▷ How are the Israeli and Arab economies linked? ▷ Did the Arabs use the land differently than Jews? If so, how?	I, II, III	7
③ Schedule community resource people representing the various groups to share their perspective on the above questions. For alternative points of view, develop e-mail pals with experts both within and outside the area.	I, II, III, IX, X	5–8
④ Students meet as a group to determine major areas for research, then assign individuals to specific topics. Divide the group into thirds. Send one group to each resource station: books/magazines, CD-ROMs, and the Internet. Students should record information in a journal to help them understand how their assigned group of people felt about Israel. Students collect text, graphics, pictures, maps, charts, and related items to support the multimedia diary entries.	I, II, III, IX, X	5–8
⑤ As in the initial research, students in Groups 1–3 assume the role of the researched people who were alive during the time period. Students write down three to five diary entries that accurately describe events of the time period and the perceived attitudes of people toward those events. Students, in essence, "walk a mile in that person's shoes." As a group they (a) collaborate and analyze notes, (b) write a rough draft summarizing the diary entries, and (c) storyboard a presentation that represents the best synthesis of the information and resources gathered. Students in Group 4 continue researching and organizing current perceptions and biases.	I, II, III, IX, X	5–8
⑥ Have individual groups select a leader to coordinate activities, then assign specific roles to group members for the creation of a multimedia diary using the rough draft of the diary entries, the storyboard, and the supportive media. After completion of the assignment, students present their diaries to their peers and discuss with the class why each group felt the way they did about the formation of the State of Israel.	I, II, III, IX, X	5–8
⑦ One member of each group joins a panel and debates issues about the formation of the Israeli state. Discuss perceptions of Who was right? and Why? Use Group 4 in the debate as the connection to current times. As an alternative, explore a current event in the Middle East. Students take the perspectives of the various groups involved.	I, II, III, IX, X	5–8

Tools and Resources

SOFTWARE:

- ▷ Multimedia-authoring (e.g., HyperStudio, Digital Chisel, Inspiration®, PowerPoint), Time Traveler (Orange Cherry New Media), video-production, presentation, mapping

HARDWARE:

- ▷ Video camcorder, laserdisc player, VCR, scanner, digital camera

WEB SITES:

Middle East Conflicts:
www.lib.umich.edu/libhome/Documents.center/arabis.html

Middle East:
www.louisville.edu/library/ekstrom/govpubs/international/mideast/mideast.html

Refugees Into Citizens:
www.brook.edu/pub/clientpr/cfr/palestin.htm

ABC News—Fractured Middle East Peace:
http://abcnews.go.com/sections/world/DailyNews/mideast_index.html

Arab-Israeli Conflict:
www.ict.org.il/ARAB_ISR/Frame.htm

Middle East Peace Talks—Wye Summit:
www.state.gov/www/regions/nea/wye_summit.html

U.S. Embassy—Middle East Peace Efforts:
www.usis-israel.org.il/publish/peace/ongoing.htm

BOOKS:

Britain and the Jews of Europe 1939–1945 by Bernard Wasserstein

Israel by Mary Jane Cahill

The Palestine Conflict by Neal Bernards

Israel by Library of Nations

Assessment

Individual journals can be checked at specific intervals during phases one and two to evaluate student progress. Develop a rubric for Groups 1–3 to evaluate the multimedia diary and presentation. Students can participate in the development of that rubric. A separate rubric can be developed for Group 4, specific to the video production and presentation of their information.

Point values for individual journals can be incorporated within the rubric. Some of the categories within the rubric might include:

- ▷ Story design and knowledge integration related to the research questions
- ▷ Clarity and creativity of movie set design, characterization, and movie production
- ▷ Presentation of final product
- ▷ Ability to address the inquiry questions
- ▷ Understanding of place from the points of view of various types of people
- ▷ Synthesis of information into diary format
- ▷ Ability to provide both geopolitical and cultural reasons for the Middle East conflict
- ▷ Evaluation and processing of geographic data

Other assessment tools might include pre- and post-evaluation of student awareness and knowledge, self-evaluation of group dynamics, and contribution to the finished product.

Credits

Steve Cowdrey and Christine Archer-Davison, Cherry Creek Schools, Colorado (www.ccsd.k12.co.us/)

Joyce S. Friske, Jenks Public Schools, Oklahoma (friskej@jenksusa.k12.ok.us)

Comments

Every year this activity produces unique results. With the rapidly changing circumstances in the Middle East, there is always new information. The Web has made very helpful current information available for analysis.

Commemoration of the Gettysburg Battlefield: The Gettysburg Address

Social Studies

Secondary Grades 9–12

Purpose

Students:

- ▷ Access multiple primary sources that provide a historical context for the Gettysburg Address
- ▷ Classify information from primary sources to form generalizations about the Civil War and democracy
- ▷ Hypothesize the primary theme of the Gettysburg Address

Description

Students use a multimedia project, *The Valley of the Shadow: Two American Communities in the Civil War*, which has been cited by the National Endowment for the Humanities as an example of the "best of the humanities on the Web," to create a presentation about the significance of the Gettysburg Address. Students work on expert teams to explore the interactive history materials. By allowing students to explore raw materials of the past, students learn how to engage actively in the construction and interpretation of American history.

Activities

PREPARATION

- ▷ As a class, construct a timeline that puts the Battle of Gettysburg into historical context with other major events of the era.

PROCEDURE	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
① Divide students into four expert teams. Each team searches for primary resources and synthesizes their findings about the Battle of Gettysburg. Student expert teams concentrate on: newspapers, letters, photographs, or maps.	II	7–10
② Brainstorm the creation of a visual organizer for gathered information. Print copies of the visual organizer to help students classify newspaper information. Sample visual organizers can be found at the Digital History Teaching Materials Web site (see Tools and Resources).		8
Newspaper Expert Team: ▷ Use the newspaper database search engine to locate newspaper articles about the Battle of Gettysburg: http://jefferson.village.virginia.edu/vshadow2/news/cwnews/allnews.html *Search suggestion: Use the keyword "Gettysburg" and select "all" for the dates.*		10

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
Letters Expert Team: ▷ Use the Civil War letters database search engine to locate letters about the Battle of Gettysburg: http://etext.virginia.edu/etcbin/ot2wwwvalley?specfile=/web/data/civilwar/valley/valley.o2w/ *Search suggestion: Use the keyword "Gettysburg" and select the dates "1861–1865."*	II, X	3, 5, 6, 7, 8, 9, 10
Photograph Expert Team: BATTLEFIELD PHOTOGRAPHS ▷ Use the Civil War Images database search engine to locate images from the Battle of Gettysburg: http://jefferson.village.virginia.edu/vshadow2/cwimages.search.html MODERN DAY PHOTOGRAPHS ▷ Imagine that you are a tourist visiting Gettysburg. Select a photo and write a postcard to describe your visit. Include descriptions and the significance of the landscape and the war monuments. Alternatively, play the role of a war correspondent, reporting on specific events.	II, X	3, 5, 6, 7, 8, 9, 10
Battlefield Map Expert Team: ▷ Answer linked questions before and after viewing the 3-D map of the Battle of Gettysburg at the following Web site: http://jefferson.village.virginia.edu/vshadow2/cwmaps.html *Note: These movies average 7 MB. Download time can be significant. If you click the links below the VRML file it will begin to download.*	II, X	3, 5, 6, 7, 8, 9, 10
③ Reconvene the class and have each expert group report on significant information they have gathered from the primary resources.		10
④ Once each group has reported, explain to the class that three months after the Battle of Gettysburg, Abraham Lincoln decided to commemorate the battle with a national ceremony. Lincoln was not the primary speaker at this ceremony, but he wrote a short speech while on the train from Washington to Gettysburg. This two-minute speech became one of the most important speeches in American history. ▷ Ask the class to hypothesize why three months after the Battle of Gettysburg Lincoln chose to hold a commemoration. Each expert group should offer information based on their examination of materials. ▷ Follow up by asking students to hypothesize what Lincoln could have said in two minutes that was so significant to American history.	II, X	3, 5, 6, 7, 8, 9, 10
⑤ Students read Lincoln's Gettysburg Address and consider the following questions, as a class or individually: ▷ How does Lincoln describe the United States? ▷ What does Lincoln believe the purpose of war to be?	II, VI, X	5, 7, 10

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
▷ What is Lincoln referring to when he says, "government of the people, by the people, for the people"?		
▷ What is the main message of the address?		
▷ Why is this address marked as one of the most significant speeches in American history?		
▷ What lesson does Lincoln say we can learn from this battle?		
⑥ Have students complete the following writing activity to synthesize their research: Imagine that you are a journalist who was sent to cover both the Battle of Gettysburg and the Commemoration of the Gettysburg Battlefield. Write a front-page story that describes the commemoration and the events that led up to it. Writing an editorial is an alternative, as long as facts are presented.	II, X	5, 7, 8, 10

Tools and Resources

SOFTWARE:

▷ American Journey: History in Your Hands: The Civil War (Primary Source Media)

WEB SITES:

Valley of the Shadows—Two Communities in the American Civil War:
http://jefferson.village.virginia.edu/vshadow2/

Digital History Teaching Materials (includes printouts of visual organizers):
http://jefferson.village.virginia.edu/vcdh/teaching/vclassroom/vclassroom.html

Library of Congress:
www.lcweb.loc.gov/

Library of Congress, copy of the Gettysburg Address:
http://lcweb.loc.gov/exhibits/gadd/4403.html

Assessment

Teachers and students together can develop a rubric to assess the newspaper article activity. The rubric can reflect not only the writing style and content, but also the research methods used to gather the information.

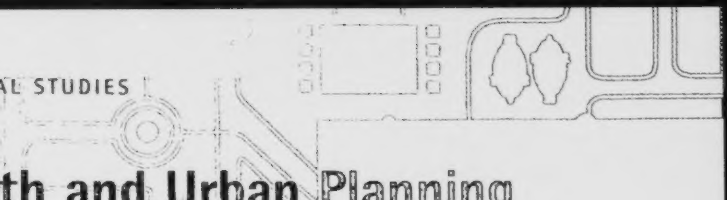
Credits

Cheryl Mason, Curry School of Education, University of Virginia, Charlottesville, Virginia (cmason@virginia.edu)

Comments

Too often, teachers require students to memorize the Gettysburg Address without having a clear understanding of the historical significance of Lincoln's famous speech. This activity has been used with high school students to actively engage them as historians. As students reconstruct this era of history, they improve not only their essential research and critical thinking skills, but also immerse themselves in the lives of individuals who lived the Gettysburg experience.

We have found that students begin to go far beyond the memorization of the Gettysburg Address and begin to ask probing questions of the members of the different expert teams to help them create a clear picture of this time in history. The research skills that they learn in this lesson stay with them as they study other historical eras and seek out primary sources such as government documents, photographs, and letters to reconstruct history—making it come alive!



Population Growth and Urban Planning

Social Studies

Secondary Grades 9–12

Purpose

World population growth is a major global issue, particularly in large cities where populations increase exponentially. What are the results of rapid population growth in cities? What changes must occur to accommodate growing populations? What are the major causes and effects of this growth?

Description

This Internet-based learning activity challenges the student to find sources online and elsewhere that describe real-world population dilemmas. Online resources can include free sites as well as subscription sites for newspapers and magazines. The activity can be altered to address different cities and regions worldwide. In preparation for the lesson, the teacher should identify local experts and Internet sites. It is not necessary to complete all of the activities for the lesson to be successful. Many activities can be altered to become grade-level appropriate.

Activities	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
① In class, students discuss the following terms and their definitions: zero population growth, population density, demographics, urban sprawl, census, immigration, migration, infrastructure, population booms (list causes), megacities, birthrate, death rate, fertility rate (FR), growth rate, natural increase, and net increase. Each student starts a glossary, which they can add to and use as a reference.	II, III	
② In small groups, discuss problems that may occur as a result of a city being heavily populated. One student records the answers on the board to be transcribed later using word-processing software. Each student chooses a different problem to research and formulates solutions. Discuss the ways in which technology affects population growth. In what ways might technology help solve problems that already exist?	II, III, VIII	1, 3
③ Search the Internet for newspaper and magazine articles that address the issue of rising population density. One example can be found in the Associated Press article "Tokyo to Use Underground Technology" (July 6, 1998). What is Tokyo's solution to the problem of lack of space? What are the benefits to this solution? What problems are developers experiencing as they implement this solution? Is this a case in which population growth has been changed by technology? After reading several pertinent articles, students discuss different ways that population problems are solved.	VII, IX	2, 7, 8
④ In small groups, students explain the situation in Tokyo using the terms listed in the first activity. Students can use an almanac, the Internet, or other resources to find statistics to support their positions. Students find the same statistics for 10, 20, and 50 years ago and compare them to more recent figures. What do students notice? They record their answers. Small group discussions between students are appropriate.	II, III, VI, X	8

	SOCIAL STUDIES STANDARDS	NETS PERFORMANCE INDICATORS GRADES 9–12
⑤ Students identify the most heavily populated cities in America. How do these populations compare with Tokyo's? What are some problems these cities are experiencing as a result of their large populations?	II, VIII	7, 8
⑥ Students trace development and population changes in the last 100 years in their own town or city. How has the population changed? How has the town or city changed to accommodate it? Students use maps, newspaper articles, the historical society, and local museums for their research. Ask someone who has lived in the town for many years to describe the changes he or she has seen. Contact a historian, obstetrician, demographer, or other population expert to comment on changes he or she has seen. Identify the reasons for changes in population (Is it birthrate? Death rate? Migration? etc.) Use as many terms from the glossaries as possible.	II	7, 8
⑦ This activity can be completed in small groups with assigned roles or individually. Using city simulation software such as SimCity 3000, students create a city and track its growth over 10, 100, and 1,000 years. What attracts individuals to cities? Students act as urban planners and produce a page layout document or poster of regulations for big city land developers to follow as they dig 330 feet into the ground.	II, III	7, 8, 9
⑧ Using word-processing software, students write a one-act play, poem, or short story about the quality of life in Tokyo in the year 2050. Based on current growth trends, what is the population? What is the standard of living? How is the population being accommodated? If possible, students include statistics in a spreadsheet to document their findings.	II	7, 8
⑨ Students prepare an on-screen computer presentation with a multimedia program, or a Web page, based on the problem they researched in the second activity. Include visual aids such as graphs, drawings, photographs from magazines, and so on. Students should include the solution they have come up with. Discuss with the class the viability of their solutions.	II, X	10
⑩ Have students imagine they are urban planners for a town in the year 2050. They describe the way their town looks right now, then develop a plan for modifying the infrastructure and social services to suit the population in the year 2100. Students create drawings of what the city looks like now and what it looked like before, and what it might look like in 50 years. They justify the placement of resources, living spaces, and recreational areas in 2050.	II, III, X	8, 9, 10
⑪ Students brainstorm what new careers might exist in the future. What career areas will need the most employees? Which ones might disappear altogether? Students develop career profiles for areas that will have heavy needs in the next 20 years. Students identify these areas and devise a career path to prepare themselves for one of these careers.	II, VIII	1

Tools and Resources

SOFTWARE:

- Web page creation, word-processing, spreadsheet, database, desktop-publishing

WEB SITES:

MIT Digital Communities—Urban Planning and Design in Cyberspace:
http://alberti.mit.edu/arch/4.207/homepage.html

CLRnet (The Centre for Landscape Research InterNetwork):
www.clr.toronto.edu/

MAXIS Corp. Simulation Home Page:
www.maxis.com/

Occupational Outlook Handbook:
http://stats.bls.gov/ocohome.htm

Census Bureau:
www.census.gov/

- Paid subscription services:

NewsBank:
www.newsbank.com/

UMI Proquest Direct:
www.umi.com/

Electric Library:
www.elibrary.com/id/101/101/

OTHER:

- Almanac, historical society, museums, demographer, historian, U.S. Census Bureau

Assessment

Each of the activities can be assessed based on individual rubrics. Many of the activities lend themselves to rubrics that can be collaboratively authored by students and teachers.

An excellent tool for assessing general research skills on the Internet can be found at www.isd77.k12.mn.us/resources/dougwri/Rubint.htm. This was developed by Doug Johnson, District Media Supervisor, Mankato Public Schools, Mankato, Minnesota (palsdaj@vax1.mankato.msus.edu).

For Web page design assessment, the Lansing School District of Lansing, Michigan, offers the following instrument: http://scnc.lsd.k12.mi.us/~bmorrow/rubric.htm.

A good tool for assessing multimedia has been developed by The Learning Space. This can be found at www.learningspace.org/. The instrument can be found at www.learningspace.org/instruct/lessons/pst4.html.

Credits

This lesson is an adaptation of a lesson called "Population Growth." The original lesson can be found on Newsbank's InfoWeb (see Tools and Resources).

Roland Garcia, Technology Coordinator, Grossmont High School Didtrict, El Cajon, California (rgarcia@grossmont.k12.ca.us)

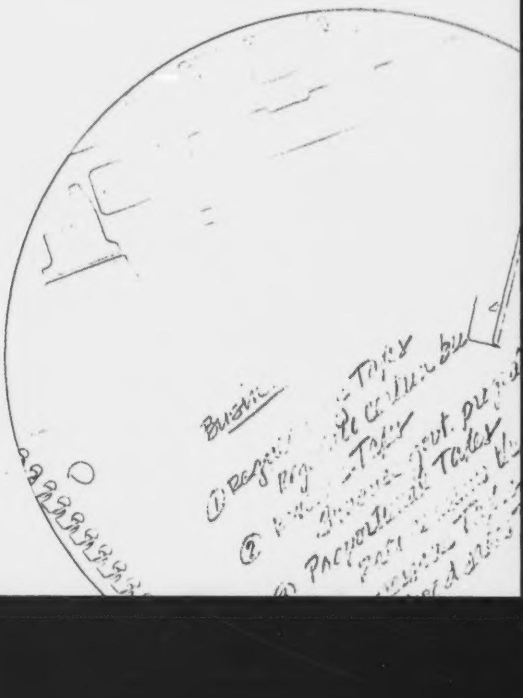
Comments

While working at O'Farrell Community School, my students successfully designed and developed cities. This was before the Internet had reached its present level of sophistication. My students created cities and then tracked the success of their cities with spreadsheet software and written logs of expenditures, population growth statistics, and urban planning.

Section 4

Multidisciplinary Resource Units

- Introduction
- PreK–2 Communities
- PreK–2 Worldwide Weather on the Web
- 3–5 Inventions
- 3–5 States
- 6–8 Advertising
- 6–8 Antarctica: The Land Under "Down Under"
- 9–12 Innovations: Past, Present, Future
- 9–12 When Does Data Become Knowledge?



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INTRODUCTION

Multidisciplinary Resource Units

As classroom strategies for learning become more student-centered, with learning of content increasingly embedded in real-world contexts, separation between academic curriculum areas becomes less defined. Problem-oriented learning that is connected to real-world problems draws from many disciplines to find solutions. When a powerful idea or relevant problem is presented in a learning context, students are motivated to collaborate, explore the idea, and find solutions. In their quest, it becomes apparent that:

- Communications skills are necessary.
- Historical perspective may provide clues to the exploration or solutions.
- Mathematical principles and skills can help in measuring, graphing, calculating, and analyzing the problem.
- Technology tools can assist in researching the problem, collecting and organizing information, and presenting results.

Learning through such multidisciplinary, student-directed learning activities has proved effective and long lasting. New learning environments must provide students with experiences in which they draw upon knowledge from several disciplines, apply a variety of strategies to get at the intended learning, and choose from a rich array of learning tools to examine, publish, illustrate, and communicate their results.

MULTIDISCIPLINARY INSTRUCTION THROUGHOUT THE GRADES

Since there is such a compelling case for multidisciplinary instruction supported with technology-based resources, how are we doing in terms of pervasive implementation? Are our students ready for this?

Children growing and developing in the 21st century will be surrounded by a more intense range of images than any generation before them. From the earliest ages they watch television, use telephones, and play with video and computer games. When students enter kindergarten they will have watched at least 4,000 hours of television and often talked on the telephone to relatives across the nation and the world.

Early Grades. Learning at early ages is very student-centered. Developmentally appropriate activities provide young children with opportunities to explore their world through a rich variety of sights, sounds, tactile sensations, and even taste and smell. School subjects, especially in preschool and kindergarten, are not separated into disciplines but are integrated as they exist in real-world situations. Multidisciplinary learning is the natural and developmentally appropriate way that learning occurs in the early years.

Early childhood education requires a rich array of hardware and software. For the young learner, the computer allows the child and teacher to create virtual realities that are both macro and micro in nature. Students observe and investigate many new and different virtual worlds through sight, sound, and tactile input and output devices. In the early years of education, the learner needs resources that can be physically and pictorially manipulated. What if I change the color of the wagon? What if I put the ball on an incline? What if I stick a pin in a balloon? The power of technology for young children's explorations of their world stimulates learning and familiarizes them with tools that will support learning throughout their lives.

Thematic, multidisciplinary instruction is increasingly being implemented in the elementary grades. Self-contained classrooms at these grade levels provide an exceptional opportunity, unconstrained by rigid time schedules, to immerse children in deep study of a theme or topic. The elementary school setting can easily support the teacher's ability to pursue units of learning with content from several subjects interwoven around a theme or problem. Technology resources enhance opportunities to locate resources on a theme, use communication skills, and publish and present results of student studies.

Middle School. In 1995, the National Middle School Association reissued its position statement articulating the essentials for both a philosophy and practice designed to act "as a guide to assist in achieving developmentally responsive educational programs for young adolescents" (National Middle School Association, 1995, p. 3). Because of the belief that curriculum is the primary vehicle for achieving the goals for middle-level education, emphasis has been placed on a relevant curriculum. The National Middle School Association defines a relevant curriculum as one that involves students, addresses developmental diversity, and helps students make sense of their life experiences through an integrative, coherent approach focused on issues significant to the students themselves. The Carnegie Foundation has mandated that middle school teachers of different subjects engage in common planning in order to foster continuity of ideas and instruction. In her book *Safe to Be Smart*, Anne Wheelock (1998) agrees that even in the face of ever-increasing pressure to conform to individual disciplines, curriculum standards educators must continue a dialogue and a purposeful effort to weave subject themes into a coherent, integrative instructional approach.

Standards can be met only by connecting students to real-world experiences that cross the artificial boundaries of individual subject areas. Technology can and must be used to facilitate making these important connections. The use of technology in middle school classrooms can assist students in applying authentic data to real-world experiences in order to make meaningful connections to their own lives. Never before in our educational history have students had the opportunity to reach out to students in other geographic locations and to mentors throughout the working world, or to immediately retrieve up-to-date resources. In the face of newly required standards-based curricula and recent insights into how students learn, it is even more important that teachers work together to foster natural bridges across curricula and that they apply advances in technology to enhance the process and engage learners.

Secondary Schools. Perhaps our greatest challenge in applying multidisciplinary learning exists at the secondary grade levels. Many high schools have yet to adjust their schedules, strategies, or educational philosophies to accommodate the need to connect learning to real-world contexts and problems. Learners will be required to do so when they enter the workplace or higher education. As increasingly powerful networking, communication, computing, and digital storage systems augment the resources of our high schools, students will experience the integration of technology and the curriculum. Information technology cuts across all disciplines. It is a powerful aid to addressing real-world multidisciplinary problems. The ability to access and store digitized information allows the student to research, collect, and share on a level hitherto unparalleled. Collaboration and consultation with fellow students, faculty, and experts near and far is fast becoming an everyday experience. Mobile computing and storage devices promise a future of anytime, anyplace learning. Increasingly powerful computers provide students with real-world problem-solving tools. They help students overcome handicaps, choose among learning strategies, perceive and create new relationships among subjects, and demonstrate their knowledge in words, pictures, moving images, and sound. The experience of these changes allows us to reconceive the high school learning environment where disciplines cross-pollinate and students' learning is truly integrated.

USING THESE UNITS

The Multidisciplinary section includes resource units designed to provide powerful themes around which multidisciplinary learning activities can be built. Each unit addresses the theme with a variety of activities, related technology, and thematically relevant information, tools, and resources. Each activity is designed to address content standards from two or more subject areas while also addressing the National Educational Technology Standards (NETS) for Students performance indicators. Units for each grade-range provide developmentally appropriate themes, tools, and resources from which teachers can choose when developing specific learning experiences.

The activities in this section are sequenced by the NETS for Students rather than chronologically, thus maximizing the array of ideas from which teachers can choose when creating a unit of instruction to address targeted objectives. As teachers read the units, they can first familiarize themselves with the performance indicators for their grade level (listed on the left side of each page). They can then peruse the collection of activities designed to meet the NETS for Students, using the curriculum standards listed to the right side of each activity to guide their selections. They can then create a multidisciplinary unit by selecting the activities that meet the instructional needs of their students. Decisions related to sequencing and where to place emphasis within particular activities so as to provide a cohesive unit of instruction are best left to the teacher's professional judgment.

Foreign Language. Activities that highlight the foreign language standards can be found everywhere in many Multidisciplinary Resource Units. There are no generic statements, such as "this activity could be carried out in a foreign language." It is important for foreign language teachers to review the section themselves to find high-quality multidisciplinary learning activities across the grade levels. As the Standards for Foreign Language Learning (1996) states:

> The conscious effort to connect the foreign language curriculum to other parts of students' academic lives opens doors to information and experiences which enrich the students' entire school and life experiences. Those connections flow from other areas to the foreign language classroom and also originate in the foreign language classroom to add unique experiences and insight to the rest of the curriculum. (p. 49)

A foreign language course has no mandated academic "content"; thus, the foreign language educator has always been free to teach a wide range of topics as long as students communicate and explore ideas in the language being studied. Technology has enhanced that process and provided many new resources and opportunities for students to learn about geography, history, the arts, literature, and science, in a new language. For example, the World Wide Web can take students to museums abroad that house a specific work or collection, and students can learn a second language in the process. With the click of a mouse, students can discover how Parisians view a specific world event, what Berliners think about their new capital city, and how children in Chile create crafts that illustrate life in their villages. Students learning a second language can explore new dimensions of any course they are studying through the connections technology provides to a global range of people and information.

PREVIEW OF THE UNITS

At the PreK–2 level, "Communities" and "Worldwide Weather on the Web" take children from a view of their neighborhood to a wider view of the world. "Communities" looks at the members of the local community, their jobs and their contributions, and compares that community to other communities that may not necessarily be in the student's own country. "Worldwide Weather on the Web" examines how weather is determined, how weather patterns develop, and how the weather affects how we function, work, and dress.

At the Grade 3–5 level, "States" and "Inventions" expose students to a wide range of resources generally accessible over the Internet. Whereas in the past students had to wait for the mail to obtain firsthand information about a given state or to get current information about the process of inventing, they can now access multiple resources, compare information, and determine if information is valid. Students are encouraged to prepare multimedia presentations on their state or on the creative process of inventing as a way of sharing their learning and gaining confidence in their ability to communicate to a larger audience.

In middle school, the "Advertising" and "Antarctica" units provide students with opportunities to engage in critical thinking. In "Advertising," students examine the types of advertising that sways buyers, examine ethical issues, and create advertisements. In "Antarctica" students connect with scientists to get firsthand answers to their questions and simulate exploration of the continent.

The units designed for high school students extend critical thinking opportunities. "When Does Data Become Knowledge?" and "Innovations: Past, Present, Future" ask students to examine how ideas or goods make a significant contribution to the world. The ability to collect data and assess it is the first form of knowledge creation. But when has enough data been collected to deem the results "knowledge"? Likewise, what makes an innovation something that will endure? What innovations are going to be necessary to survive the 21st century?

CONCLUSION

As teachers examine the Multidisciplinary Resource Units, they should reflect on their own teaching and the units they are currently using. How does technology enable them to teach content at greater depth? In what ways can they use technology to enhance instruction?

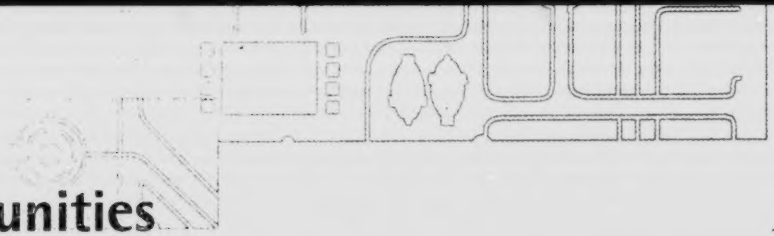
The following units are examples of ways to use technology to create a better learning environment for students. As with previous sections, teachers will undoubtedly develop units that combine new ideas with what they have used before. Teachers should share these ideas by posting them on the NETS Project Web site at www.iste.org/ (click the Standards Projects link), on the Web site of their local school or district, on the Web sites of professional associations, or in other appropriate places on the Internet.

Carnegie Council on Adolescent Development. (1989). *Turning points: Preparing American youth for the 21st century.* New York: Carnegie Corporation.

National Middle School Association. (1995). *This we believe: Developmentally responsive middle level schools.* Columbus, OH: Author.

National Standards in Foreign Language Education Project. (1996). *Standards for foreign language learning: Preparing for the 21st century.* Lawrence, KS: American Council on the Teaching of Foreign Languages.

Wheelock, A. (1998). *Safe to be smart: Building a culture for standards-based reform in the middle grades.* Columbus, OH: National Middle School Association.



Primary
Grades
PreK–2

Communities

The notion of communities is no longer limited to just a neighborhood. Children bring to school perceptions of the world they have gained from television, networks, and computers. Technology opens the door for children to participate in information exchanges with children from various cultures and different parts of the world. In this unit, students learn about various aspects of their communities, beginning with the family and extending to the greater community. Students then compare their communities with the communities of other children around the world.

Parents, adult helpers, and cross-age tutors can work collaboratively with very young children to provide developmentally appropriate assistance throughout the activities.

NETS Performance Indicators *Prior to completion of Grade 2, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Use input devices (e.g., voice activation, mouse, keyboard, and remote control) and output devices (e.g., a monitor and printer) to successfully operate computers, VCRs, audiotapes, telephones, and other technologies. (1)	▷ Use drawing or painting software to make pictures of family members. (Input devices might include a mouse, touch screen, Muppet keyboard, graphics tablet, and scanner.)	ELA 8 SS IV, V	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks Easy Book SuperPrint HyperStudio Kid Works Deluxe HARDWARE: Touch screen Color inkjet printer Audiotape player Video camcorder Digital camera Muppet keyboard Scanner Large-screen monitor, LCD panel, or classroom TV connected to a computer Graphics tablet
	▷ Use a digital camera to create pictures of family members or community helpers. Print the pictures in Big Book form, laminate them, cut them apart, and create puzzles.	ELA 8 SS IV, V	
	▷ Use an audiotape player to listen to a story about the community—perhaps a recording of an elderly community member talking about the area or a student relating a story about the community.	ELA 1, 4 SS IV	
	▷ Use a scanner to digitize pictures taken during a family trip or outing to another community. Create a show-and-tell slide show using a large-screen monitor, LCD panel, or classroom TV connected to a computer.	ELA 4 SS III	
	▷ Observe the physical characteristics of the school playground and then use the keyboard to input observations.	ELA 4, 5 *K-4 SCI A1, B1, D1 SS III, IV	

	▷ Use various input devices to explore computer activities on the Children's Television Family Workshop Web site.	ELA 1 SS III, VIII	WEB SITE: CTW Family Workshop: **www.ctw.org/**
② Use a variety of media and technology resources for directed and independent learning activities. (1, 3)	▷ Use word-processing software to write a story about a family event or trip. Make copies for other students to read.	ELA 5, 6 IL 7, 8, 9 SS IV, V	SOFTWARE: Bailey's Book House SuperPrint Easy Book Spreadsheet ClarisWorks for Kids AppleWorks Kid Works Deluxe Kid Pix Studio Community Construction Kit Neighborhood Map Machine HARDWARE: Color inkjet printer Audiotape player Video camcorder Video game players with games Digital camera Scanner TV Radio Telephone WEB SITES: Mr. Rogers' Neighborhood: **www.pbs.org/rogers/** Canadian Kids Page: **www.onramp.ca/~lowens/**
	▷ Use television, telephones, radios, video games, and other resources available in the community for independent learning in math, science, social studies, and language arts.	K–4 SCI F2, F4 SS V, VII	
	▷ Use Big Book software (e.g., Easy Book, Scholastic SuperPrint Deluxe) to create and print a story based on a student's family tree.	ELA 5, 6, 12 SS IV, V	
	▷ Create a computer slide show using an existing set of digitized pictures of neighborhood landmarks and slide show software such as Kid Pix Studio.	ELA 6 SS III	
	▷ Use painting software or Neighborhood Map Machine to create, illustrate, and print a simple school map, then give directions verbally on how to get from one place to another.	MATH 3 K–4 SCI B1, F5 SS III	
	▷ Use Community Construction Kit to design and construct 3-D models of the community.	MATH 3 K–4 SCI B1, F5 SS III	
	▷ Use the Mr. Rogers' Neighborhood Web site or television videos to learn about family, community helpers, people, and places in the community.	ELA 1, 8 SS III, IV, V	
	▷ Examine the many links found on the Canadian Kids Page to learn about the Internet Web community.	ELA 1, 7, 8, 12 MATH 5 SS III, V	

③ Communicate about technology using developmentally appropriate and accurate terminology. (1)	▷ Practice using correct terminology for technology devices, resources, and procedures.	ELA 4 K–4 SCI E2 SS VIII	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks Kid Works Deluxe HyperStudio SuperPrint Graph Club GraphPower HARDWARE: Digital camera Color inkjet printer
	▷ Use painting or drawing software to make a picture dictionary that describes and illustrates correct terminology for technology devices, resources, and procedures. Print the dictionary for classroom use.	ELA 4, 5, 6 K–4 SCI E2 SS VIII	
	▷ Work with a family member to make a list of technology resources used at home. Use graphing or multimedia-authoring software to draw, tabulate, or graph the information for use in a class discussion.	ELA 4, 5, 6 K–4 SCI E2 SS VIII	
④ Use developmentally appropriate multimedia resources (e.g., interactive books, educational software, and elementary multimedia encyclopedias) to support learning. (1)	▷ Use interactive CDs (simulations, bilingual books, dictionaries, encyclopedias, and instructional games) to explore, investigate, and learn about different communities.	ELA 1, 2, 3 K–4 SCI D1, D3 SS III, V	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks HyperStudio SuperPrint Easy Book Logo Let's Pretend Just Grandma and Me Richard Scarry's Busytown Multimedia encyclopedias Interactive dictionaries
	▷ Use turtle geometry software (Logo) to explore and draw shapes of things found at home and in the community.	MATH 1, 2, 9 SS III, V	
	▷ Examine and explore community-related multimedia products created by older students.	ELA 1 K–4 SCI D1, D3 SS III	
	▷ Use Web page creation software to make a Web page about the local community, working with local businesses frequented by or employing parents. Scan or take digital pictures to enhance the site.	ELA 5, 6, 8, 12 SS III, VI, VIII	

⑤ Work cooperatively and collaboratively with peers, family members, and others when using technology in the classroom. (2)	▶ In teams, hide a treasure somewhere at school. Use painting or drawing software or turtle geometry software (Logo) to create a map for finding the hidden treasure. Take turns using the map to find one another's treasure.	ELA 5, 6, 8, 12 MATH 3, 6 SS III	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks Graph Club GraphPower SuperPrint Logo HyperStudio Kid Works Deluxe Web Workshop Neighborhood Map Machine HARDWARE: Color inkjet printer Video camcorder Digital camera Scanner Audiotape player
	▶ Go on a field trip, such as a walk in a community park. Take digital pictures and use an audiotape recorder to record observations on the different plants, trees, and insects. With the assistance of an adult partner, use spreadsheet software to summarize the information. Create and print graphs from the spreadsheet information. Working with an adult or older student, develop a small multimedia project that reports on the observations, using graphs, charts, digital pictures, sounds, and summaries.	ELA 4, 5, 6, 7, 11 MATH 2, 3, 4 K-4 SCI A1, B1, D1 SS III	
	▷ Work with cross-age partners and use Internet resources and multimedia-authoring software to write and illustrate a story about community helpers in a distant community. Compare the distant community with the local community.	ELA 5, 6, 8, 11, 12 SS III, V, VII	
	▷ Work with classmates to establish a set of procedures and rules to be used when working with different types of technology resources.	ELA 4, 9, 11 IL 8 K-4 SCI E2 SS V, VIII	
⑥ Demonstrate positive social and ethical behavior when using technology. (2)	▷ Work with classmates to establish a set of appropriate behaviors when using technology with classmates, family members, older students, and adults.	ELA 4, 9, 11 K-4 SCI F5 SS IV, V	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks HyperStudio

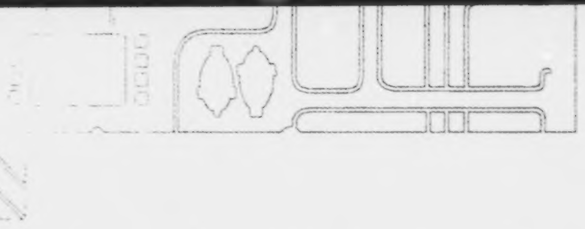
	▷ Go to a local festival or market unique to the community. Take digital pictures and record observations of cultural traditions. Work with an adult to gather additional resources and then create a report or Big Book about the festival or market.	ELA 5, 6, 8, 12 K-4 SCI A1 SS III, V, VIII	SuperPrint Easy Book HARDWARE: Color inkjet printer Digital camera Scanner
	▷ Create digital postcard thank-you notes to send to community helpers via electronic mail.	ELA 5, 6, 8, 9 K-4 SCI F5 SS I	
⑦ Practice responsible use of technology systems and software. (2)	▷ As a group, develop and discuss rules for creating and printing an alphabet chart focused on the community. (Each letter of the alphabet represents a name or phrase related to the community.) After creating the chart, discuss how well the rules worked and suggest changes for future activities.	ELA 4, 9 IL 8 SS III, V, VI, VIII	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks HyperStudio SuperPrint Easy Book Web Workshop HARDWARE: Color inkjet printer Digital camera Scanner
	▷ Work with a local businessperson or other adult to create a class Web site. Discuss the concepts of ownership, publication of student projects, copyright, and use of the class site for different types of publications.	ELA 4, 6, 8, 11 K-4 SCI E2 SS V, VI, X	
⑧ Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)	▷ Scan or take digital pictures of family members. Place the pictures, student writing, and sound recordings about families in a multimedia presentation. Create a virtual quilt on the Web to share with parents and other classes.	ELA 1, 4, 5, 8, 9 IL 1, 8, 9 SS IV, V	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks Graph Club GraphPower

	▷ Poll parents to learn about their job(s). Gather digital pictures and use Web page creation software to make Web pages representing the types of jobs available in the community. Use creative dramatics to create video skits illustrating different types of jobs projected for the future.	ELA 1, 4, 5, 8, 9 MATH 2, 9 K–4 SCI E2 SS IV, V, VII	Easy Book SuperPrint Logo HyperStudio Web Workshop Kid Works Deluxe HARDWARE: Digital camera Scanner Color inkjet printer Video camcorder VCR
	▷ Work in teams to create digital postcards using a Web page or multimedia-authoring software. The page should profile important helpers in the community and be shared with other classes on the Web.	ELA 4, 5, 6, 8, 11, 12 SS III, V, VI, VII	
	▷ Bring special family items or artifacts to class. Take digital pictures of the items and then work with older students to create a multimedia presentation about family history or culture.	ELA 4, 5, 6, 7, 8, SS I, II, III, IV, V	
	▷ In small teams, take a walking tour of local businesses and interview business owners, gathering specific data on how the business has developed and changed over the years. Create a multimedia presentation that summarizes how community businesses have changed.	ELA 4, 5, 6, 7, 8, 9, 11 SS II, III, IV, V	
⑨ Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, and drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)	▷ Use interactive instructional games, such as Thinkin' Things to enhance thinking skills and problem-solving skills.		SOFTWARE: Graph Club Easy Book Kid Works Deluxe HyperStudio Cruncher, The Thinkin' Things ClarisWorks for Kids AppleWorks Kid Pix Studio Web Workshop
	▷ Work on specific projects developed by the teacher that require working together to collect data. Use database or spreadsheet software to record, sort, classify, and graphically represent information. Later, analyze similarities and differences. (Some project ideas include having students learn about the origins of the street	IL 1, 8, 9 K–4 SCI A1 SS II, III, IV	

	names in the community, the origins of house and building addresses for each street, and the origins of their family's name.)		TimeLiner HARDWARE: Color inkjet printer Audiotape player Video camcorder Digital camera Scanner
	▷ Work with a senior citizens' group to document historical community events. Use a timeline program to depict the results of interviews. Discuss with the teacher how the community has changed over time and the ways in which it remains the same.	ELA 1, 4, 8, 9 SS I, II, III	
Gather information and communicate with others using telecommunications, with support from teachers, family members, or student partners. (4)	▷ Use URL tracking software, such as TrackStar, to pre-set destinations for students to use in taking an Internet overview of their community. The URLs should feature business and nonbusiness Web sites.	SS III	SOFTWARE: SuperPrint Easy Book Kid Works Deluxe HyperStudio ClarisWorks for Kids AppleWorks Kid Pix Studio Web Workshop HARDWARE: Color inkjet printer Audiotape player Video camcorder Digital camera Scanner WEB SITES: TrackStar: **http://scrtec.org/track/index.html** epals Classroom Exchange: **www.epals.com/** Global Schoolhouse: **www.gsn.org/project/index.html**
	▷ Contact a partner school in a different community. Identify several criteria to be shared via the Internet (e.g., names, foods, festivals, and weather). Create a study timeline and communicate regularly using the Internet. Record, sort, and classify the information and identify patterns, similarities, and differences.	ELA 1, 2, 3, 4, 5, 6, 7, 8, 11, 12 MATH 2 SS II, III, V, VI, VII, VIII	
	▷ Investigate, with senior citizens, the name and history of the community. Use the computer to write and illustrate a story based on the information gathered. Use the Web to exchange the story with other classes.	ELA 5, 6, 7, 8, 11, 12 SS II, III, IV	
	▷ Use the book *I Went Walking* and create a story about "This is the Way We Go to School." Partner with multiple schools around the world to collaborate and share stories. After the information from various schools has been placed on the Web, read, classify, and	ELA 4, 5, 7, 8, 9, 11, 12 K–4 SCI A1, B1, D1, F2, F4 MATH 2, 9 SS I, III	

sort the information in different ways. Discuss the similarities and differences between children and communities around the world.		Intercultural E-Mail Classroom Connections: www.stolaf.edu/network/iecc/ Global Rigby: www.reedbooks.com.au/rigby/global/keypal.html Web66: http://web66.coled.umn.edu/ Penpal Class Box: www.ks-connection.org/ BOOK: *I Went Walking* by Sue Williams
▷ Work in teams to create digital postcards of 10 places that best describe the community. Send postcards to other classes via the Internet.	ELA 4, 5, 6, 8, 12 IL 1, 8, 9 SS II, III, V	

Credits: Joyce Friske, Frank Withrow, Sheryl Abshire, Steve Cowdrey, JoAnn Gadicke, Ellen Lopez, Shannon McCoy, Susan Nothwehr, and Barbara Ridgway



Worldwide Weather on the Web

Primary Grades PreK–2

Weather influences each of us every day. From an early age, children learn about weather through a variety of formats and media. Weather is a part of daily life and affects what we wear, what we do, and where we go. All children have had common experiences with weather, and they bring that knowledge base to the classroom. Use these common experiences to build multidisciplinary activities that capture children's interests and actively engage them in the learning process. In this unit students learn about the various elements that go into generating a weather forecast. Students investigate trends in local weather and compare and contrast local weather with weather reported by other students around the world. Parents, adult helpers, and cross-age tutors work collaboratively throughout these unit activities to provide developmentally appropriate assistance to very young children.

NETS Performance Indicators *Prior to completion of Grade 2, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Use input devices (e.g., voice activation, mouse, keyboard, and remote control) and output devices (e.g., a monitor and printer) to successfully operate computers, VCRs, audiotapes, telephones, and other technologies. (1)	▷ Record information on daily temperatures in a predesigned template using a variety of input devices, including an audiotape player, keyboard, Muppet keyboard, and others. Students can use local news sources or weather Web sites.	IL 1 MATH 2 *K–4 SCI A1, D3 SS III	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks Graph Club GraphPower Easy Book SuperPrint Kid Works Deluxe HARDWARE: Color, inkjet printer Audiotape player Video camcorder Digital camera Muppet keyboard Scanner WEB SITES: The Weather Channel: www.weather.com/ AccuWeather: www.acuweather.com/
	▷ Observe cloud forms and use a digital camera to photograph them. As a class, have students prepare an electronic slide show.	ELA 4, 5 K–4 SCI D1 SS III	
	▷ Use a scanner to digitize pictures representing the seasons of the year. Have students print the pictures for display.	ELA 4 SS III	
	▷ Observe a form of precipitation, such as rain, fog, snow, drizzle, mist, sleet, or hail, and use a keyboard to record observations. Have students print the results.	ELA 4, 5 K–4 SCI D3 SS III	

			Automated Weather Source: www.aws.com/
② Use a variety of media and technology resources for directed and independent learning activities. (1, 3)	▷ Use word-processing software to write a story about a thunderstorm.	ELA 5	SOFTWARE: Sammy's Science House SuperPrint Easy Book Kid Pix Studio Graph Club GraphPower ClarisWorks for Kids AppleWorks Kid Works Deluxe Weather in Action: Air HARDWARE: Color inkjet printer Audiotape player Video camcorder Digital camera Scanner TVs Telephones Radios Video game players with games WEB SITES: The Weather Channel: www.weather.com/ How the Weather Works: www.weatherworks.com/monthly/activities/skywindow.html Automated Weather Source: www.aws.com/schools/
	▷ Use television, telephones, radios, video games, and other technology resources to create a weather center that can be used for independent learning in math, science, social studies, and language arts.	K–4 SCI B1, D1, D3, E2 SS III	
	▷ Use clip art or pre-existing pictures to create an electronic slide show of severe weather warning flags.	ELA 8 K–4 SCI F5	
	▷ Use the Weather Channel Web site to investigate weather in other communities.	IL 1, 2, 3 K–4 SCI B1, D3 SS III	
	▷ Observe the sky and use a digital camera to photograph it. Use the How the Weather Works Web site to determine the range of colors in the sky pictures.	IL 1, 2, 3 K–4 SCI D3, B1 SS III	
	▷ Draw and then scan pictures representing a favorite season. Students work with their upper grade buddies to dictate a weather poem or story to be published in a class Big Book.	ELA 5, 6 IL 5 K–4 SCI D3 SS III	
	▷ Use drawing or painting software to create and illustrate a story about the wind on a spring or winter day.	ELA 5, 6 K–4 SCI D1, F4	
	▷ Use a video camera to record a skit in which students forecast the weather for the day.	ELA 5, 6 K–4 SCI D3, F4 SS III	
	▷ Use informational CDs to explore weather concepts.	ELA 6, 8 K–4 SCI D3	

③ Communicate about technology using developmentally appropriate and accurate terminology. (1)	▷ Practice using correct terminology for technology devices, resources, and procedures when using technology resources.	ELA 5 K–4 SCI E2 SS VIII	SOFTWARE: Kid Pix Studio Kid Works Deluxe ClarisWorks for Kids AppleWorks SuperPrint Easy Book HARDWARE: Digital camera Color inkjet printer WEB SITES: Automated Weather Source: www.aws.com/ The Weather Channel: www.weather.com/ AccuWeather: www.acuweather.com/
	▷ Use drawing or painting software to make a picture dictionary that describes and illustrates correct terminology for technology devices, resources, and procedures used at school.	ELA 5, 6 K–4 SCI E2 SS VIII	
	▷ Take a field trip to a weather station. Make a list of technology resources used there and use word-processing software to record and print the information for class discussion.	ELA 5, 6, 8 K–4 SCI E2, F5	
	▷ Create an online daily class journal that includes a brief weather report and a description of how the weather will affect class activities. Students explain how the weather data was gathered and measured.	ELA 5, 6, 8 IL 1, 5, 9 MATH 4, 8, 10 K–4 SCI A1, A2, D2, D3, E2, G1 SS III	
④ Use developmentally appropriate multimedia resources (e.g., interactive books, educational software, and elementary multimedia encyclopedias) to support learning. (1)	▷ Listen to a story about imaginary weather events. Have students use multimedia software to create digital stories about imaginary weather phenomena, including passages in which characters react to weather conditions.	ELA 1, 5, 6, 8 IL 5 K–4 SCI B1, D2, D3, E3	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks HyperStudio SuperPrint Easy Book Kid Works Deluxe Just Grandma and Me Logo Compton's Interactive Encyclopedia
	▷ Use Just Grandma and Me Interactive Living Book to find shapes in the clouds. First, have students predict what the cloud shape will be. Then, let them discover the shape and use drawing or painting software to create their own cloud object or shape.	ELA 1 IL 1, 5 MATH 3 K–4 SCI D3	
	▷ Use turtle geometry software (Logo) to explore, design, and print snowflake patterns.	MATH 3 K–4 SCI D1	

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	▷ Examine and explore weather-related multimedia products created by older students.	ELA 1 K-4 SCI D1, D3 SS III	HARDWARE: Color inkjet printer Audiotape player Video camcorder Digital camera Scanner BOOKS: *Cloudy with a Chance of Meatballs* by Judi Barrett *Pickles to Pittsburgh* by Judi Barett
	▷ Use interactive CDs (simulations, bilingual books, dictionaries, encyclopedias, and instructional games) to explore, investigate, and learn about weather.	K-4 SCI D1, D3 SS III	
③ Work cooperatively and collaboratively with peers, family members, and others when using technology in the classroom. (2)	▷ Work with upper grade buddies to assemble a weather station. Students should learn how to use different weather instruments to measure and record the temperature, dew point, barometric pressure, wind direction and speed, and precipitation.	IL 9 MATH 4, 10 K-4 SCI A1, A2, B3, D2, D3, E2 SS III, VIII	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks Graph Club GraphPower Easy Book SuperPrint Logo HyperStudio Kid Works Deluxe Web Workshop HARDWARE: Color inkjet printer Audiotape player Video camcorder Digital camera Scanner Weather measurement instruments
	▷ Choose a favorite kind of weather. Students work collaboratively with their classmates to create a five-senses weather poem. Publish the poem in a class Big Book	ELA 1, 5, 7, 8 IL 1, 3, 4 K-4 SCI D2, D3 SS II, III	
	▷ Work in pairs to research and record daily weather information. Students use graphing software to create a monthly chart with weather codes and symbols.	ELA 5, 6, 11 IL 5 K-4 SCI D1, D3	
	▷ Make observations of clouds or puddles at frequent intervals during the day. Have students work with an adult in small groups to create a multimedia slide show that presents their observations.	ELA 5, 6, 7, 8 K-4 SCI A1, D1, D3 SS III	

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			WEB SITES: The Weather Channel: **www.weather.com/** Automated Weather Source: **www.aws.com/schools/** AccuWeather: **www.acuweather.com/**
⑥ Demonstrate positive social and ethical behaviors when using technology. (2)	▷ Work with classmates to establish a set of procedures and rules to be used when working with different types of technology resources. Students should use the subject of weather when doing demonstrations or giving examples.	ELA 4, 9, 11 K–4 SCI E2 SS V, VIII	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks HyperStudio SuperPrint Easy Book Graph Club GraphPower Kid Works Deluxe HARDWARE: Color inkjet printer Digital camera Scanner WEB SITES: The Weather Channel: **www.weather.com/** Automated Weather Source: **www.aws.com/schools/**
	▷ Work with classmates to establish a set of appropriate behaviors when using technology with classmates, family members, older students, and adults.	ELA 4, 9, 11 K–4 SCI F5 SS V	
	▷ Create digital weather postcards to share with other classes from other cultural communities.	ELA 5, 6, 8, 9 K–4 SCI F5 SS I	
	▷ Discuss the effects of weather predictions on our daily activities and the importance of accurate predictions. Have students show what the effects of "a joke weather report" be.	ELA 4, 11 IL 2, 7 K–4 SCI A2, C3, D2, D3, F5 SS III, V	

⑦ Practice responsible use of technology systems and software. (2)	▷ Discuss responsible use of hardware, software, and the Internet when obtaining and using weather information.	ELA 4 IL 8 K–4 SCI E2 SS V, VIII, X	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks Easy Book Web Workshop HARDWARE: Color inkjet printer Digital camera Scanner
	▷ Develop rules with classmates for creating and printing an alphabet chart focused on weather. Make sure students understand the rules and procedures before beginning work on the alphabet chart. After the chart is completed, have the class discuss how well the rules worked and suggest changes for future activities.	ELA 4, 9 SS V	
	▷ Work with a businessperson or other adult to create a class weather Web site. Have students add a new page, daily. Have the class discuss the concept of student ownership, copyright, and the use of the class site for other types of publications.	ELA 4, 8, 11 IL 8 K–4 SCI E2 SS V, VI, X	
⑧ Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)	▷ Read *Flash, Crash, Rumble and Roll* to learn safety facts about weather. With support from peers or adults, students create a multimedia presentation about how to remain safe in one's home, school, or community. After reading the text, have students take a Web-based online safety quiz on lightning.	ELA 1, 4, 5, 7, 8 IL 1, 5 K–4 SCI B3, C3, D2, D3, F1 SS III	SOFTWARE: Kid Pix Studio ClarisWorks for Kids AppleWorks Graph Club GraphPower Kid Works Deluxe SuperPrint Logo HyperStudio Web Workshop HARDWARE: Digital camera Scanner Color inkjet printer
	▷ Use multimedia software to design graphics for different types of daily weather. Students use the graphics to record daily weather conditions on an electronic calendar. Have them print a copy and cut the calendar apart, by days. Have them sort and organize the weather data to identify patterns.	ELA 4, 5, 6, 7, 8 IL 1, 2, 3 MATH 2, 5 K–4 SCI D1, D3 SS III	

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	▷ Create and present to other students and adults a slide show using weather data collected during one or more months.	ELA 4, 8 IL 5 MATH 8, 10 SS III	BOOK: *Flash, Crash, Rumble and Roll* by Franklyn Mansfield Branley
	▷ Take digital pictures of clouds. Have students work with an upper grade buddy to create a multimedia presentation featuring stories about cloud shapes, incorporating pictures, text, and sound.	ELA 4, 6 IL 1 MATH 2, 4 K–4 SCI A1, D2, D3 SS III	
⑨ Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, and drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)	▷ Create a weather report card to assess the accuracy of local weather reports. Have students record the next day's forecast and then record the actual weather for that day. Students can use a rubric to evaluate the data collected for the week. Have them compare the accuracy of television stations, newspapers, and other media sources. The report card can be sent to local weather reporters by e-mail.	ELA 4, 5, 7, 8 IL 1, 2 MATH 5, 8 K–4 SCI A1, A2, B3, D2, D3, G1 SS III	SOFTWARE: Spreadsheet Graphing Database WEB SITES: epals Classroom Exchange: **www.epals.com/** Global Schoolhouse: **www.gsn.org/project/index.html** Intercultural E-Mail Classroom Connections: **www.stolaf.edu/network/iecc/** Global Rigby: **www.reedbooks.com.au/rigby/global/keypal.html** Web66: **http://web66.coled.umn.edu/** Penpal Class Box: **www.ks-connection.org/**
	▷ Collect daily precipitation and temperature readings from around the country. Sort and classify the weather data using simple spreadsheet software. Analyze the differences in weather around the country and then graph the information in several different ways.	ELA 5, 6 IL 2, 6 MATH 5, 8, 9, 10 K–4 SCI A1, D3, F4 SS III	
	▷ Use the Weather Channel and Mesonet Web sites to track a weather front. Use spreadsheet or database software to track and record changes in the weather before and after the front moves through the community.	ELA 5, 7, 8 MATH 3, 5, 10 K–4 SCI A1, D2, D3, F4	

	▷ Use spreadsheet or database software to track and record light intensity, twice a day, on an Internet weather station site (e.g., Mesonet). Analyze the information and then graph the comparison data.	ELA 4, 5, 7, 8 IL 1, 2, 9 MATH 2, 4 K-4 SCI A1, B3, D3, F5	OTHER: Weather balloons
	▷ With the assistance of parents or older students, send up a series of weather balloons to trace wind current patterns. Have students record the daily information that they receive by e-mail from other locations. Have them graph the data.	ELA 4, 5, 7, 8 MATH 1, 2, 4, 10 K-4 SCI A1, A2, B3, D1, D3 SS III	
Gather information and communicate with others using telecommunications, with support from teachers, family members, or student partners. (4)	▷ Participate in the Global Schoolhouse online project "It Was a Dark and Stormy Night." In this project, students record weather-related data (the date, high and low temperatures, humidity, barometric pressure, mood, and overall weather conditions) for two weeks during each of three designated months. After the data is collected, it is sent to Franklin Junior Senior High School, where students at the school compile and analyze the data and return results to the originating class.	ELA 3, 4, 5, 7 IL 1, 2 MATH 5, 8 K-4 SCI A1, A2, D2, D3, E1, E2, G1 SS III	SOFTWARE: SuperPrint Easy Book Kid Works Deluxe HyperStudio Cruncher, The ClarisWorks for Kids AppleWorks Kid Pix Studio Web Workshop TimeLiner HARDWARE: Color inkjet printer Audiotape player Video camcorder Digital camera Scanner WEB SITES: epals Classroom Exchange: www.epals.com/
	▷ Start a chain story by creating fictional characters in a unique weather setting. Students forward the story-starter to other school sites with the requirement that each school tie the weather at their location into their addition to the story.	ELA 4, 5, 7 IL 5 SS III	

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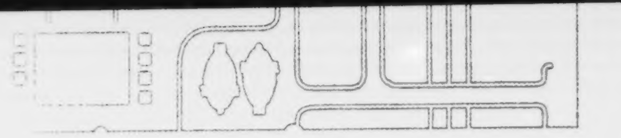
▷ Send pen-pal letters to students at a partner school in another hemisphere. Have them describe the weather each day for a week and compare and contrast how the weather where they are affects the way they live.	ELA 4, 5, 9 IL 6 K–4 SCI D3, F4 SS III	Global Schoolhouse: **www.gsn.org/project/index.html** Intercultural E-Mail Classroom Connections: **www.stolaf.edu/network/iecc/**
▷ Take a virtual field trip to examine the weather in other regions of the world. Use the TrackStar Web site to select appropriate sites and prepare for the virtual field trip. Have students discuss what to wear in each place they visit.	ELA 1, 7, 8 IL 1, 2, 9 K–4 SCI E2, F4 SS III	Global Rigby: **www.reedbooks.com.au/rigby/global/keypal.html** Web66: **http://web66.coled.umn.edu/**
▷ Create an online daily class journal that includes a brief weather report and how the weather affects class activities. Students can explain how the weather information was gathered and measured.	ELA 5, 6, 8, 11, 12 MATH 4, 8, 10 K–4 SCI A1, A2, D2, D3, G1 SS III	Penpal Class Box: **www.ks-connection.org/** TrackStar: **www.scrtec.org/track/index.html**
▷ Use Web Workshop to create multiple Web pages about weather and seasonal changes. Have students exchange the pages with other buddy schools. Have them compare and contrast how these changes take place during the year.	ELA 4, 5, 7, 8, 9 K–4 SCI A1, D1, D3, F4 SS III	Automated Weather Source: **www.aws.com/schools/** The Weather Channel: **www.weather.com/**

Credits: Joyce Friske, Frank Withrow, Sheryl Abshire, Steve Cowdrey, JoAnn Gadicke, Ellen Lopez, Shannon McCoy, Susan Nothwehr, and Barbara Ridgway

Notes:



Intermediate
Grades
3–5

Inventions

"Everything that can be invented has been invented."
Charles H. Duell, Commissioner, U.S. Office of Patents, 1899

Students are naturally curious about how things are made, where they come from, and how they work. This unit is designed to introduce students to inventors, their inventions, and the impact they have had on our lives.

These resources may be helpful in planning units:
Invention and Technology: www.proteacher.com/110031.shtml
20th Century Inventors and Inventions: www.mthhs.mtlib.org/pd_invent.html
Learning Resources: www.stjohns.k12.fl.us/cl/invent.html
Invention Mystery: www.edu.gov.mb.ca/metks4/tech/currtech/imym/invact.html

NETS Performance Indicators *Prior to completion of Grade 5, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Use keyboards and other common input and output devices (including adaptive devices when necessary) efficiently and effectively. (1)	▷ Imagine that the class is taking a trip to the moon. Copy images from the Internet that show inventions that would be needed to survive on the moon for three months. Paste these images into a Web image folder. Use creative writing to describe the setting, feeling, mood, texture, color, and other details. As the project progresses, assess efficient and effective use of various input and output devices. As a group, present imaginative findings in a multimedia format.	ELA 8 *K–4 SCI D2 5–8 SCI D3 SS III	SOFTWARE: Presentation Multimedia-authoring Word-processing WEB SITE: Prototyping Guidelines: www.ayersconcepts.com/protop.htm
② Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide. (1, 2)	▷ Discuss ethical considerations and the impact on society of new inventions. What jobs have been lost and gained because of inventions? How has space travel affected our economy? Has technology made life easier or harder? How? What inventions do kids take for granted? How have these inventions affected their lives?	ELA 4, 11 IL 8 K–4 SCI F5 5–8 SCI F5 SS VIII	

*Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI

③ Discuss basic issues related to responsible use of technology and information and describe personal consequences of inappropriate use. (2)	▷ Compare the costs of an invention, over time. Calculate the cost in today's dollars compared to the cost of the invention at the time it was first sold.	ELA 3, 7 IL 6 MATH 1, 2, 4, 5, 6 SS VII	SOFTWARE: Spreadsheet TimeLiner WEB SITES: History of the World: **www.hyperhistory.com/** Important Historical Inventions and Inventors: **www.lib.lsu.edu/sci/chem/patent/srs136.html** Science and Oddity Inventions: **www.yahooligans.com/Science_and_Oddities/Inventions/**
	▷ Become familiar with plagiarism, patent, trademark, and copyright laws. How do these laws affect the process of inventing? What effects have they had on technology innovation?	IL 8 SS II, V, VI, VII, X	
	▷ Justify answers to the following questions: Is the moon a better or worse place to live than the earth? If the moon became a good place to live, how would people preserve the moon's ecological balance?	K–4 SCI F4 SS III	
④ Use general-purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)	▷ Create a timeline of inventions and inventors. This timeline can be a class project that continues to grow as students do more research. Use creative writing and illustrations, using painting and drawing software, to expand the timeline into a mural.	ELA 2, 3, 4 IL 3 MATH 1, 4, 9 SS II	SOFTWARE: Word-processing Drawing or painting Multimedia-authoring Presentation Spreadsheet Database Cruncher, The Graph Club GraphPower TimeLiner WEB SITES: History of the Sciences: **http://sophia.smith.edu/hsc/museum/ancient_inventions/home.htm**
	▷ Take a poll of classmates, family members, or community members. Ask them what they consider to be the top 10 inventions in the last 100 years. Graph the results. Include the time of the poll on the timeline.	ELA 7, 12 IL 7 MATH 5, 8, 9, 10 SS VIII	

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▶ In cooperative learning groups, invent a machine to do a task that is not currently done by machines. Write a story about it. Research lesser-known inventions to get ideas. Create a trademark, logo, and slogan for the invention. Explain the creative process that took place in coming up with the invention. Incorporate cooperative learning and a team approach. Present the results in a format appropriate for sharing with the class.	ELA 4, 5, 6, 12 IL 3 MATH 3, 9, 10 K–4 SCI E1 5–8 SCI E1	Human Experts, Human Interests: **http://americanhistory.miningco.com/msub16.htm** American Inventors and Inventions: **www.150.si.edu/150trav/remember/amerinv.htm** Kooky Inventions: **www.girltech.com/HTMLworksheets/IN_kooky.html**
▶ Write a story or keep a journal for a specified length of time about what life would be like without various inventions. Produce a spreadsheet on the effect, if applicable.	ELA 4, 5, 6, 12 IL 2 SS VIII	Keep Inventing and Keep Improving: **www.ayersconcepts.com/creativ.htm** Leonardo da Vinci: **http://banzai.msi.umn.edu/~reudi/leonardo.html**
▶ Investigate the ages of famous inventors when they developed their most notable idea. Graph the inventors' ages in five-year spans. Consider the generalizations that can be made about the age of inventors.	ELA 3, 8 IL 3 MATH 4, 5, 10 SS II	Become an Inventor: **www.girltech.com/HTMLworksheets/IN_invention_2.html**
▶ Write a newspaper, radio, or television script describing the time when a new invention was created. Look at the Alexander Graham Bell Web site as an example. Role play the script. Use closed circuit television, an intranet, or video to share the play.	ELA 4, 5, 6, 11, 12 IL 3 MATH 4 SS II	Invention Dimension: **http://web.mit.edu/invent/** What Makes an Inventor Successful? **http://mustang.coled.umn.edu/inventing/Inventing.html**
▶ Classify inventions used in a previous activity by the type of components used. Describe their classification system and give a rationale for it. Depending on the teacher's objective, the classification system can be a scientifically accepted system or a system students derive.	ELA 7, 11 IL 3 MATH 2 K–4 SCI E1 5–8 SCI E1, E2	Rube Goldberg: **www.rube-goldberg.com/** Rube Goldberg: **www.unitedmedia.com/ncs/goldberg.html** Important Historical Inventions and Inventors: **www.lib.lsu.edu/sci/chem/patent/srs136.html**

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	▷ Use creative writing to demonstrate knowledge about inventions. For example, create a riddle called "Guess My Invention" or write a concrete poem describing an invention using onomatopoeia or another teacher-specified device.	ELA 4, 5, 6, 12 IL 3	Alexander Graham Bell Virtual Museum: **http://bell.uccb.ns.ca/** History of the World: **www.hyperhistory.com/**
⑤ Use technology tools (e.g., multimedia authoring tools, presentation tools, Web tools, digital cameras, and scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)	▷ Produce a radio or television news segment interviewing a famous inventor. Have students dress according to the time period.	ELA 4, 6, 12 IL 5 K–4 SCI G1 5–8 SCI G1 SS II	SOFTWARE: Word-processing Presentation Graphics Desktop-publishing Web page creation HARDWARE: Video camera Large-screen monitor, LCD panel, or classroom TV connected to a computer Video digitizer with mixing software WEB SITES: Black American Inventions—Inventor of the Week: **http://emeagwali.com/Upscale_Magazine_1996.html** Invention Dimension: **http://web.mit.edu/invent/** Science and Oddity Inventions: **www.yahooligans.com/Science_and_Oddities/Inventions/**
	▷ Demonstrate knowledge of inventions by designing a game show in which students compete, dressed as famous inventors. Share the game show with others by videotaping it or using other technology.	ELA 2, 4, 5, 6, 11, 12 IL 5 SS II	
	▷ Create an advertising campaign for an invention that students have created, including graphics, description, and price. Compile a catalogue of class inventions.	ELA 4, 5, 6, 12 IL 5 MATH 1, 4 SS VII	
	▷ Create a virtual museum exhibit on a chosen inventor. Create Web pages for various elements of the museum. Use the Web to share the project.	ELA 7, 8 IL 5 K–4 SCI G1 5–8 SCI G1 SS II	
	▷ Design an invention that would ensure world peace. Describe how it is made, sold (or not), and distributed. Describe its attributes. These inventions can be created as a group project and shared as a group presentation.	ELA 7, 8 IL 9 K–4 SCI G1 5–8 SCI G1 SS VIII, IX	

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			Alexander Graham Bell Virtual Museum: **http://bell.uccb.ns.ca/** Social Innovations: **www.worldtrans.org/ISI.html** Important Historical Inventions and Inventors: **www.lib.lsu.edu/sci/chem/patent/srs136.html**
⑧ Use telecommunications efficiently and effectively to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests. (4)	▷ Communicate with senior citizens to determine what inventions have most influenced their lives. Communication can be made via e-mail or Internet with senior citizen groups across the country. Compare findings for various groups of senior citizens.	ELA 4, 7, 11, 12 IL 9 SS II, IV	SOFTWARE: Word-processing Videoconferencing HARDWARE: Telephone WEB SITES: Web search for adaptive technologies City Web site Local newspaper Web site Senior Net: **www.seniornet.org/** American Inventors and Inventions: **www.150.si.edu/150trav/remember/amerinv.htm** Invention Dimension: **http://web.mit.edu/invent/** Keep Inventing! **www.ayers-concepts.com/creativ.htm** Rube Goldberg: **www.rube-goldberg.com/**
	▷ Find a specialist in math, science, the social sciences, or related curriculum areas. Interview the individual about the tools used in his or her work that can be traced to early inventors in the field. This activity can be expanded to include any job field the students or teacher is interested in. Use videoconferencing software to conduct a live, online interview.	ELA 4, 7, 11, 12 IL 4 MATH 9 SS VIII	
	▷ Research a list of classroom, home, city, or state problems that an invention would solve. Interview a local official for current information.	ELA 7, 8 IL 6 SS V	
	▷ Take an invention and brainstorm ways it could be improved to make it more effective. Describe the materials that would be used if the invention were re-created.	ELA 11 IL 2 K–4 SCI E1 5–8 SCI E1 SS VIII	

	▷ Research the process for obtaining a patent. Create a patent review board and develop acceptance criteria. Appear before the patent board to have a patent issued. Invite a guest speaker who is either a patent lawyer, an inventor, or an official who has experience obtaining patents.	ELA 1, 4, 7, 8 IL 1 SS VIII	Rube Goldberg: **www.unitedmedia.com/ncs/goldberg.html** U.S. Patent Office: **www.uspto.gov/** Patents and Idea Protection: **www.ayers-concepts.com/intel_p.htm** Prototyping Guidelines: **www.ayers-concepts.com/protop.htm** U.S. Code Title 35 Patents: **www4.law.cornell.edu/uscode/35/** OTHER: Newspaper
	▷ Identify the body parts required to use a chosen invention. Determine whether the invention is adaptable for people who are physically challenged.	ELA 7 IL 2 K–4 SCI C1, E1 5–8 SCI C1, E1	
⑦ Use telecommunications and online resources (e.g., e-mail, online discussions, and Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)	▷ Research how different cultures have benefited through various inventions. Build a Web site to share findings. Encourage collaborative exchanges among Web site visitors from other cultures. Consider linking with other classrooms around the world to share ideas.	ELA 1, 7, 8, 9 IL 9 K–4 SCI E1 5–8 SCI E1 SS I, VIII, IX	SOFTWARE: Web page creation WEB SITES: Become an Inventor: **www.girltech.com/HTMLworksheets/IN_invention_2.html** Keep Inventing and Keep Improving: **www.ayers-concepts.com/creativ.htm** Important Historical Inventions and Inventors: **www.lib.lsu.edu/sci/chem/patent/srs136.html** Library of Congress: **www.loc.gov/** epals Classroom Exchange: **www.epals.com/**
	▷ Trace the development and use of a particular invention, around the world, from invention to adoption (such as the automobile, the television, or video games).	ELA 1, 7, 8 IL 1 MATH 4 SS II, VIII	

			Global Schoolhouse: **www.gsn.org/project/index.html** Intercultural E-Mail Classroom Connections: **www.stolaf.edu/network/iecc/** Global Rigby: **www.reedbooks.com.au/rigby/global/keypal.html** Web66: **http://web66.coled.umn.edu/** Penpal Class Box: **www.ks-connection.org/**
⑧ Use technology resources (e.g., calculators, data collection probes, videos, and educational software) for problem-solving, self-directed learning, and extended-learning activities. (5, 6)	▷ Build a complicated machine to do what a simple one already does. Begin by adding at least two steps to the original process. Complete an activity using The Factory software. Videotape demonstrations of the complex machines and dub copies for parents to view at home.	IL 3 MATH 3, 4, 6 K–4 SCI B1 5–8 SCI B2, B3	SOFTWARE: The Factory Deluxe WEB SITES: Science and Oddity Inventions: **www.yahooligans.com/Science_and_Oddities/Inventions/** What Does it Take to Become an Inventor? **www.girltech.com/HTMLworksheets/IN_invention_2.html** Rube Goldberg: **www.rube-goldberg.com/**

			What Makes an Inventor Successful? **http://mustang.coled.umn.edu/inventing/Inventing.html**
⑨ Determine when technology is useful and select the appropriate tool(s) and technology resources for problem-solving, self-directed learning, and extended-learning activities. (5, 6)	▷ Write a biography of an inventor. Include the inventor's successful and unsuccessful inventions. Describe the motivations of and the obstacles faced by the inventor. Prepare a presentation about the inventor's life for the class.	ELA 2, 4, 5, 6, 8, 11, 12 IL 5 K–4 SCI G1 5–8 SCI G1, G2 SS II	SOFTWARE: Word-processing Multimedia-authoring Presentation WEB SITES: History of the World: **www.hyperhistory.com/** Leonardo da Vinci: **http://banzai.msi.umn.edu/~reudi/leonardo.html** Science and Oddity Inventions: **www.yahooligans.com/Science_and_Oddities/Inventions/** National Inventors Hall of Fame? **http://inventors.miningco.com/msub5.htm** Important Historical Inventions and Inventors: **www.lib.lsu.edu/sci/chem/patent/srs136.html** Inventor of the Week: **http://web.mit.edu/invent/**
	▷ Imagine that a famous inventor has somehow appeared in modern times. Describe the inventor's impressions of how his or her inventions have been used, and what things the inventor might invent now. Present the material as a play, script, story, or multimedia presentation.	ELA 4, 5, 6, 11, 12 IL 5 SS VIII	
	▷ Create a class table of inventions that came about from failures of other inventions, e.g., Post-It Notes, which were developed using glue intended for another purpose.	ELA 8 IL 3 MATH 2, 9, 10 SS II	
⑩ Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information resources. (6)	▶ Demonstrate that not all online information is reliable. Compare information on one inventor or invention from two different online sources, in terms of accuracy and comprehensiveness.	ELA 1, 3, 11 IL 2 SS II	WEB SITES: Any two Web sites previously accessed

Credits: Frada Boxer, Paula Conley, Erlene Killeen, Ann McGlone, Melissa Pierson, Heidi Rogers, Lynne Schrum, and Paul Tarantiles

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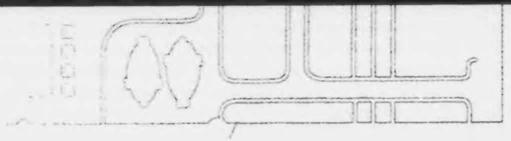

Intermediate
Grades
3–5

States

They are ours, so let's take care of them! Fifty parts, millions of people, thousands of lakes, hundreds of rivers and mountains. This unit uses various technologies to explore the many facets of our 50 states. During the intermediate grades, students often write research reports within the context of a study of the United States. The following activities are designed to enhance that study, providing additional resources and ways to connect with current information as well as historical facts.

NETS Performance Indicators *Prior to completion of Grade 5, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Use keyboards and other common input and output devices (including adaptive devices when necessary) efficiently and effectively. (1)	▶ Demonstrate the effective and efficient use of input/output devices by using word processing or e-mail to send a business letter requesting tourist information from a state bureau of tourism. Practice requesting specific information. Do an Internet search on the state to gather the required contact information.	ELA 4, 5, 6, 8, 12 SS III	SOFTWARE: Word-processing HARDWARE: Scanner WEB SITES: Search for U.S. states
	▶ Construct a press release, newspaper article, news bulletin, or video news report covering current events in the state. Demonstrate effective and efficient use of input/output devices during the activity.	ELA 4, 5, 11 IL 1, 4 SS III	
② Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide. (1, 2)	▷ Design a theme restaurant representing the state (name, theme food, menu with theme names, and logo). Include cost, food prices, entertainment, and other details. Identify positive ways technology might be used and how it might be overused to develop and operate the restaurant.	ELA 4, 8, 12 MATH 4, 8	SOFTWARE: Word-processing Spreadsheet Graphics Multimedia-authoring Presentation WEB SITES: Search for specific states

	▶ Use technology as both a research and presentation tool to celebrate the early people of the state. Construct a project that shows evidence that students have learned a key aspect of the history of the state. Insert the element of how technology developed within the state, as well as technology's influence on changes in the state's economy.	ELA 7, 8, 11, 12 IL 3, 4, 6 SS II, III	
③ Discuss basic issues related to responsible use of technology and information and describe personal consequences of inappropriate use. (2)	▷ Discuss netiquette. Interact with keypals from a selected state to learn facts about the state.	ELA 4, 5, 7, 8 IL 1, 3, 9 SS III	WEB SITES: epals Classroom Exchange: **www.epals.com/** Global Schoolhouse: **www.gsn.org/project/index.html** Intercultural E-Mail Classroom Connections: **www.stolaf.edu/network/iecc/** Global Rigby: **www.reedbooks.com.au/rigby/global/keypal.html** Web66: **http://web66.coled.umn.edu/** Penpal Class Box: **www.ks-connection.org/** American Auto Club: **www.aaa.com/** Trip Info: **www.thetrip.com/**
	▷ Plan a trip to the state, with an itinerary for places to visit. Access the state's Web site for tourist information. Use travel Web sites to obtain information. Present the trip in a multimedia format. Discuss responsible use of commercial Web sites related to travel.	ELA 7, 8, 11, 12 IL 3, 4, 6 SS II, III	

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④ Use general-purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)	▷ Create a class database of state facts, including population figures, land area, date of statehood, name of capital, unemployment rate, average temperature and precipitation, high and low elevation, natural resources, and a unique fact. Create activities with the collected information.	ELA 1, 3, 7, 12 IL 1, 3 MATH 2, 4, 5 *K–4 SCI D3 *5–8 SCI D1 SS III, VII	SOFTWARE: Database Graphics Multimedia encyclopedia Desktop-publishing Word-processing WEB SITES: Fifty States: **www.50states.com/** The U.S. Mint: **www.usmint.gov/**
	▷ Use graphics software to design a coin face for the chosen state for the 50 State Quarters Program. Submit the designs to the U.S. Mint. Write an explanation of the creative process and the decisions made in designing the coin.	ELA 4 IL 3, 6, 7 SS III, VII	
	▷ Use desktop-publishing software to design a trifold travel brochure or a billboard for the state.	ELA 3, 4, 8, 11 SS III	
	▷ Use a multimedia encyclopedia to research famous people from the state. Add the information to the class database and create an electronic trading card about one famous person.	ELA 1, 3, 4, 5, 6, 7, 8, 9, 11, 12 IL 1, 3, 4 MATH 5 SS II	
⑤ Use technology tools (e.g., multimedia authoring tools, presentation tools, Web tools, digital cameras, and scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)	▷ Create a slide about the chosen state using a multimedia-authoring program. As a class, create a multimedia presentation with a slide for each state that includes state facts.	ELA 4, 5, 6, 8, 11, 12 IL 1, 2, 3 SS III	SOFTWARE: Multimedia-authoring Mapping HARDWARE: Video camcorder VCR WEB SITE: Carol Hurst's Children's Literature site: **www.carolhurst.com/** Read Across the U.S.A.: **www.dreamscape.com/quirk/projdet.htm**
	▷ In groups, create a video commercial advertising the attractive qualities of states within a given region.	ELA 4, 6, 8, 11, 12 IL 4, 5, 6 SS III	
	▶ Participate in Reading Across the USA, a reading incentive program. Plot at least a nine-state, coast-to-coast trip using mapping software. Read a book about each state. Research facts about the states before	ELA 1–12 IL 1, 3, 4, 5 SS III	

	selecting the books. After a book is read, construct a card that links a book review to each state. (The content of the book should be linked to some aspect of the state. A goal of this activity is for students to read and report on a minimum of one book per month during the school year.)		
	▶ Use word-processing software to create and maintain a journal about an imaginary trip to and through the state.	ELA 4, 5, 6, 8, 11, 12 IL 6 K–4 SCI C3, D1, F4 5–8 SCI C4, C5, D1, F2 SS III	
⑥ Use telecommunications efficiently and effectively to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests. (4)	▶ Interact with keypals in other states to gather information about the state's best vacation spots for students. Research the vacation spots and make a multimedia report.	ELA 4, 5, 7, 8 IL 1, 3, 9 SS III	SOFTWARE: Multimedia-authoring WEB SITES: epals Classroom Exchange: **www.epals.com/** Global Schoolhouse: **www.gsn.org/project/index.html** Intercultural E-Mail Classroom Connections: **www.stolaf.edu/network/iecc/** Global Rigby: **www.reedbooks.com.au/rigby/global/keypal.html** Web66: **http://web66.coled.umn.edu/** Penpal Class Box: **www.ks-connection.org/**

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⑦ Use telecommunications and online resources (e.g., e-mail, online discussions, and Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)	▶ Play a global mystery game, such as Where in the World Is Roger? (A simulation game, such as Where in the U.S.A. Is Carmen Sandiego? can reinforce students' understanding of the attributes of the 50 states.)	ELA 1, 3, 9, 10, 11, 12 IL 1, 4, 5, 6, 7, 9 SS III	SOFTWARE: Where in the U.S.A. Is Carmen Sandiego? Multimedia encyclopedia Word-processing
	▶ Create a continuous multimedia show from state reports. Play the slide show at parent gatherings.	ELA 3, 5, 8, 12 IL 9 SS III	WEB SITES: Fifty States: **www.50states.com/** Where in the World Is Roger? **www.gsn.org/**
	▶ Use the Internet to research endangered species in a selected state. Use e-mail, forms on Web sites, or a word-processed letter to make recommendations on endangered species to appropriate government agencies or nonprofit organizations.	ELA 1, 3, 4, 5, 6, 7, 8, 11, 12 K-4 SCI C1, C2, C3 5-8 SCI C4, C5	Environmental Education Link: **www.eelink.net/** Infoseek search on endangered species
⑧ Use technology resources (e.g., calculators, data collection probes, videos, and educational software) for problem-solving, self-directed learning, and extended learning activities. (5, 6)	▶ Adapt a recipe to serve 150 people using a food native to the state. (This activity can be very effective when using National Inspirer software.)	ELA 4, 5 IL 4 MATH 1, 2, 4, 6	SOFTWARE: National Inspirer
⑨ Determine when technology is useful and select the appropriate tool(s) and technology resources for problem-solving, self-directed learning, and extended learning activities. (5, 6)	▶ Create a trifold travel brochure focused on bringing tourists to the state. Use desktop-publishing software, Internet sites, and multimedia encyclopedias.	ELA 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 SS III	SOFTWARE: Desktop-publishing Multimedia encyclopedia HARDWARE: Scanner
	▶ Use various technology tools to create a postcard, button, license plate, state coin, state stamp, or bumper sticker for the chosen state.	ELA 4, 8, 12 IL 3, 4, 5, 6, 9 SS III	WEB SITE: The U.S. Mint: **www.usmint.gov/**

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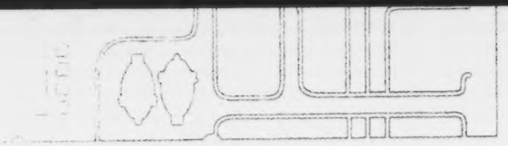
⑩ Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information resources. (6)	▶ Use the Internet to research endangered species in a selected state. Use e-mail, forms on Web sites, or a word-processed letter to make recommendations to appropriate government agencies on ways to improve habitat.	ELA 1, 3, 4, 5, 6, 7, 8, 11, 12 IL 1, 2, 7, 9	SOFTWARE: Word-processing WEB SITES: Environmental Education Link: **www.eelink.net/** Endangered species: **www.bagheera.com/**

Credits: Frada Boxer, Paula Conley, Erlene Killeen, Ann McGlone, Melissa Pierson, Heidi Rogers, Lynne Schrum, and Paul Tarantiles



Middle
Grades
6–8

Advertising

Students in our society are constantly bombarded by advertisements. Technology has not only added to the impact and quantity of advertising but has led to the development and proliferation of new types of advertising. Fortunately, technology is a powerful tool in the hands of students for investigating and understanding the impact of advertising on their lives.

NETS Performance Indicators *Prior to completion of Grade 8, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)	▶ Find solutions for hardware and software problems that occur during the upcoming activities. Consult manuals and apply troubleshooting strategies in an efficient manner. Where necessary, the teacher should guide students in developing and implementing the strategies.	ELA 7, 8	SOFTWARE: Built-in help systems WEB SITES: Online FAQs and troubleshooting assistance BOOKS: Software manuals
② Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)	▶ Find examples of advertisements in the media where technology is used to bend reality or create fantasy (e.g., a basketball player leaping six feet above the rim and dunking the ball through the rim). Discuss the relevant scientific laws. For example, find examples in advertisements where Newton's Three Laws of Motion are being violated. Capture the "violation" and create a multimedia presentation exploring the inaccuracies.	ELA 1, 8, 11 IL 1, 2 MATH 3, 4 *5–8 SCI A1, A2, B1, B2, E1	SOFTWARE: Multimedia-authoring Image-manipulating (e.g., Kai's Power Soap) Word-processing Database HARDWARE: TV, VCR OTHER: Print and electronic advertisements

*Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI A2, C3, F1).

	▷ Study the effects of image manipulation technology on advertising. Use photo-retouching software to explore how images can be modified or distorted. Find examples of ads that use these techniques.	ELA 3, 6, 11 IL 3	
	▷ Study how computer terms are used in both computer-related ads and general ads. As a first step, identify and classify computer terms (e.g., "information highway," "RAM").	ELA 3, 6, 9 IL 1, 2 MATH 5, 8	
③ Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse. (2)	▷ Research the laws that apply to each activity and seek permissions where appropriate. Students should be reminded of the importance of obeying copyright law.	ELA 7, 8, 11 SS VII	WEB SITE: Copyright and Fair Use: **http://fairuse.stanford.edu/**
④ Use content-specific tools, software, and simulations (e.g., probes, graphing calculators, exploratory environments, and Web tools) to support learning and research. (3, 5)	▷ Use a topic-specific simulation program to study propaganda advertising on TV, the Web, and so on. Create classifications for advertisements or use existing advertisement classification systems. Create a database and do a report.	ELA 1, 3, 7 IL 1, 2, 3 MATH 2, 5, 10 SS IV, VIII	SOFTWARE: Decisions, Decisions: Violence in the Media Database Multimedia-authoring Spreadsheet
	▷ Use scientific probes with graphing calculators or computers to measure respiration rates (or record heart rates, the old fashioned way) of people watching different types of advertisements. For example, videotape five different types of television commercials (e.g., a loud, obnoxious commercial; an "action" commercial; a humorous commercial; and so on).	IL 1, 3 MATH 4, 5, 10 5-8 SCI A1, C3, E1, F5	HARDWARE: TV, VCR Scientific probes Graphing calculator

	Record the heart rate of students watching each advertisement. Enter the data into a spreadsheet. Calculate the mean, maximum, and minimum heart rates. Create bar charts. Look at a different commercial and predict what the mean class heart rate will be. Gather data to test the prediction.		
⑤ Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)	▷ Investigate advertising for long distance telephone companies (e.g., 10-10-321, Sprint). Select the long distance service that appears to be the least expensive. Research the actual cost of making calls of different lengths (1 minute, 2 minutes, 3 minutes, and more than 20 minutes). Enter the data into spreadsheets. Write up results using a word processor or make a multimedia presentation.	ELA 4, 8, 12 IL 1, 2, 3 MATH 1, 5, 7, 8, 10 SS VII	SOFTWARE: Spreadsheet Word-processing Multimedia-authoring WEB SITES: Consumer Reports: **www.consumerreports.org/** Web advertisements OTHER: TV and print advertisements Cereal boxes
	▶ Study advertisements for cruises and compare prices. Use Web sites to create a virtual cruise (e.g., students are given a $2,000 expense account to plan the best vacation to a given spot). Download images and put together a multimedia presentation of the tour.	ELA 4, 5, 7 IL 1, 2, 3 MATH 5, 6 SS III, VII	
	▶ Determine the percentage of the surface area in particular magazines, newspapers, and Web sites that is dedicated to advertising. Do the same analysis for advertising time on talk shows. Record the data in a spreadsheet and generate charts. As an extension, study the cost of advertising as compared with public service announcements (i.e., newspaper space, on the Web, and so forth).	IL 2 MATH 4, 5, 10 SS VII	

	▶ Use spreadsheet software to compare several different advertised interest rates and leasing plans for new automobiles. Determine the actual cost if a person "owns" the car for two years and drives it 25,000 miles under the different interest rates and leasing options. Determine the costs for two years and 40,000 miles. For five years and 100,000 miles? Create a graph with miles driven on one axis and cost of care on the other. Superimpose various cars on the same graph for comparison.	IL 2 MATH 1, 5, 6, 7 SS VII	
	▶ Create spreadsheets comparing the ingredients of 10 to 15 brands of breakfast cereal. Use the data to define and select the "best" cereal. Create a video advertisement based on the cereal's merits. Compare these ads to TV ads and discuss differences.	ELA 4, 6, 11 IL 2, 3, 4 MATH 5 5–8 SCI A1, C1, E1, F1 SS VII	
⑥ Design, develop, publish, and present products (e.g., Web pages and videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)	▶ Do an advertising strategy scavenger hunt on the Internet. For example, find a Web site that sells luxury items using "snob appeal," one that uses humor as an advertising technique; and one that has what appears to be false or misleading scientific information. Create a Web tutorial for other students on advertising techniques, describing the techniques and providing links to Web sites. Invite visitors to the site to contribute their own examples.	ELA 1, 3, 6, 11 IL 1, 2 SS VII	SOFTWARE: Word-processing Database Web page creation Mapping WEB SITES: Internet Advertising Resource Guide: **www.admedia.org/** Skills and Strategies for Media Education: **www.medialit.org/ReadingRoom/keyarticles/skillsandstrat.htm** Nike: **www.nikebiz.com/index_nj.html**

	▷ Survey the labels of gym shoes that are either worn by students in the class or brought in by the teacher. On a computer-based map, plot the countries of manufacture to investigate the global nature of commerce. An extension might involve a study of labor laws in certain nations and their use of child labor.	ELA 7, 8, 11 IL 1, 2, 3 MATH 5, 8 SS IV, VII	Boycott Nike: **www.saigon.com/nike/** Global Exchange–Nike Campaign: **www.globalexchange.org/economy/corporations/nike/** Dog Eat Dog Films–Nike Initiative: **www.dogeatdogfilms.com/nike2.html**
⑦ Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information. Develop collaborative solutions or products for audiences inside and outside the classroom. (4, 5)	▷ Use videos of television advertisements and foreign Web sites to study international humor in advertising. Use Web66 or a similar site to identify schools in at least three other countries with which to share humorous ads from their own cultures. (This can serve as an excellent opportunity to highlight the contributions of multilingual students.) After obtaining permission under copyright laws, create a Web site to share submissions from each of the countries. Include on the Web site an analysis of the differences in humor in each country.	ELA 1, 3, 7, 9, 10 FL 4.1, 4.2 IL 1, 2	SOFTWARE: Graphics HARDWARE: Scanner WEB SITES: epals Classroom Exchange: **www.epals.com/** Global Schoolhouse: **www.gsn.org/project/index.html** Intercultural E-Mail Classroom Connections: **www.stolaf.edu/network/iecc/** Global Rigby: **www.reedbooks.com.au/rigby/global/keypal.html** Web66: **http://web66.coled.umn.edu/**
	▷ Receive coaching on electronic and other types of advertising from a mentor in the advertising field or from a large company with an in-house marketing staff.	ELA 11	

	▷ Use an Internet project-based research technique to conduct a research project on food additives and colors. Communicate with food scientists to mentor and guide the research.	ELA 1, 3, 7, 11, 12 IL 1, 5, 7, 9 5–8 SCI A1, B1, E1, F1, F4	Penpal Class Box: **www.ks-connection.org/** Internet Advertising Resource Guide: **www.admedia.org/** Food Additives and Preservatives: **http://crucial.ied.edu.hk/foodchem/additive.html** FDA: **http://vm.cfsan.fda.gov/** OTHER: TV videos
⑧ Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)	▶ Design and conduct taste tests on a specific type of snack food or fast food to determine if decisions to purchase these foods are influenced more by taste, price, or advertising. Select appropriate software for collecting and analyzing data, and for presenting findings.	ELA 6, 7 IL 1, 2, 3 5–8 SCI A1, C3, E1 SS IV, VII	SOFTWARE: Spreadsheet Multimedia-authoring Presentation Word-processing Database
	▶ Create T-shirts or design a logo to promote a product. Identify and select appropriate software and hardware for completing the task.	ELA 4 IL 5 MATH 5, 10	HARDWARE: Scanner Digital camera
⑨ Demonstrate an understanding of concepts underlying hardware, software, and connectivity, and of practical applications to learning and problem solving. (1, 6)	▶ Study animation in advertising. Use 3-D animation software to create an animated advertisement.	IL 1, 5	SOFTWARE: Digital art

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⑩ Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)	▶ Compare general population statistics (e.g., at the U.S. Census Bureau, NIH Web site) with the following characteristics that appear in clothing advertisements: ethnicity/race, male/female, age, and body type. Write or create a multimedia report on bias in advertising.	ELA 6, 8, 11 IL 1, 2, 3 SS III, VII	SOFTWARE: Word-processing Database Multimedia-authoring Presentation WEB SITES: U.S. Census, NIH: **www.census.gov/** Mankato: **http://lme.mankato/mankato.html** Reliability of Internet Information: **http://toolkit.imsa.edu/islma/reliability.html#reliable**
	▶ Investigate and discuss the Mankato Web site. Find Web sites that have "false advertising." Find Web sites that promote products that are not good for you (e.g., cigarettes). Find Web sites that promote a product that improves the quality of life. Make a multimedia presentation on the benefits and dangers of the Web.	ELA 1, 3, 8, 11, 12 IL 1, 2, 7 5–8 SCI F1, F4 SS IV, VII	

Credits: Debbie Silver, James Wiebe, Roland Garcia, James Klein, Vivian Meiers, Dennis O'Connor, Jim Schultz, and Melanie Sprouse

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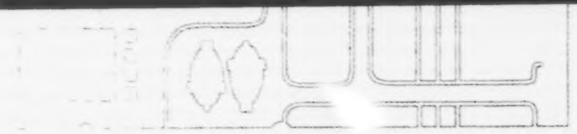

Antarctica: The Land Under "Down Under"

Middle Grades 6–8

Antarctica remains the last unspoiled wilderness on earth. It is a place that has been set aside to be used exclusively for education and exploration. Though physically remote, the continent is highly accessible to students through the Internet and other multimedia resources. The Antarctic well of information is rich and deep, making it a superb focus for a multidisciplinary unit. In order to retrieve, record, review, and analyze current Antarctic issues, students must use a wide variety of technologies.

Teachers should preview the following Web sites before beginning their explorations:
International Centre for Antarctic Information and Research: **www.icair.iac.org.nz/**
NASA: **http://passport.ivv.nasa.gov/antarctica/tg/intro.html**
Antarctic Exploration: **www.acnatsci.org/exhibits/antarctica/links.html**
www.glacier.rice.edu/, http://tea.rice.edu/, http://ice.wizard.net/,
www.antdiv.gov.au/resources/index.html

NETS Performance Indicators *Prior to completion of Grade 8, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)	▶ Find solutions for hardware and software problems that occur during the following activities. Consult manuals and apply troubleshooting strategies in an efficient manner. (Where necessary, the teacher will guide the students in developing and implementing these strategies.)	ELA 7, 8 *5–8 SCI E1, E2	SOFTWARE: Built-in help systems WEB SITES: Online FAQs and troubleshooting assistance BOOKS: Software manuals
② Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)	▶ Use timeline software to communicate historical information about the settlement of Antarctica, its culture, and changes in the environment. Pay attention to changes in communications and technology that have made consistent and rapid communication with Antarctic bases possible.	ELA 3 IL 3 MATH 4, 9 5–8 SCI E1, G1 SS II	SOFTWARE: TimeLiner WEB SITES: Historic Timelines: **www.search-beat.com/history.htm** Starting Point for Antarctica Research: **www.geog.le.ac.uk/cti/ant.html**

	▷ Research the impact that scientists and technicians working in Antarctica might have had on the environment. Research the steps scientists have taken to reduce or eliminate that impact.	ELA 1, 7, 8 IL 1, 3 5–8 SCI F2, F5, G1, G3 SS II, III	
③ Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse. (2)	▷ Read the "Antarctic Hotheads" story in the April 1995 issue of *Discover* magazine. Discuss the consequences of the hoax presented in the story and debate the legal and ethical issues. Did the magazine assume that readers would believe the April Fool's Day hoax or did the editors intend to deceive their readers? Does publication on the Internet establish the authenticity of information? Discuss the misuses of technology and related ethical issues. Find Web sites with misinformation.	ELA 1, 3, 6, 8, 11 5–8 SCI A1, A2	WEB SITES: Text of the *Discover* magazine article: **http://he.net/~x/misc/iceborer.htm** *Discover* magazine photo and text: **http://mrfrench.cslab.uwlax.edu/~rueck_cw/pages/wildlife/iceborer.html**
④ Use content-specific tools, software and simulations (e.g., environmental probes, graphing calculators, exploratory environments, and Web tools) to support learning and research. (3, 5)	▷ Locate the research stations in Antarctica by going to the Web site for the Scientific Community on Antarctica Research (SCAR). Use a map with longitude and latitude lines to locate the sites. Contact a research station for a current data set on their project. Use a spreadsheet to form generalizations. (Note the diverse sponsoring countries, a potential further multidisciplinary area of study.)	ELA 3, 11 IL 1, 2 MATH 2, 4, 5, 9 5–8 SCI B2, B3, D1, E1 SS III	SOFTWARE: Spreadsheet Word-processing WEB SITES: Scientific Community on Antarctica Research: **www.scar.org/Antarctic%20Info/Stations%20in%20Antarctica.html** ICAIR: **www.icair.iac.org.nz/icair/** Antarctic Explorers: **www.terraquest.com/va/history/ages/discovery.html**
	▷ Use books, articles, and the Internet to research one of the Antarctic explorers. Use word-processing software to create a journal that a selected explorer might have written.	ELA 1, 3, 4, 5, 6, 8, 11 IL 1, 3 5–8 SCI G1, G3	

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	▷ Use the Internet to access and record daily weather statistics from Antarctica. Create a graph comparing weather statistics from students' home towns. Identify specific instruments that would be necessary to collect similar data in these cities. Create a digital weather broadcast that reports and compares the data. Videotape or telecast the broadcast.	ELA 3, 4, 8, 11 IL 1, 2, 3 MATH 4, 5, 8, 9, 10 5–8 SCI B2, B3, D1, E1, E2 SS III	U.S. Antarctic Program: **http://adelie.asa.org/** WWW Virtual Library—Meteorology: **www.ugems.psu.edu/~owens/WWW_Virtual_Library/**
⑤ Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)	▷ Plan a one-month trip to Antarctica, including all the materials and food necessary. Use software to design a budget. Include information on the need for physical conditioning.	ELA 8, 11 IL 3, 4, 5 MATH 1, 5, 6, 9 SS III, VII	SOFTWARE: Spreadsheet SimLife or other program for studying the relationship between genetics and the environment
	▷ Use the Internet to investigate animals in Antarctica. Use word-processing software to write a description of a genetically altered animal superbly adapted to Antarctica. Use multimedia software to draw an anatomical diagram of the animal. Provide interactive explanations of the environmental adaptations.	ELA 1, 3, 4, 7, 8 IL 1, 5, 6 5–8 SCI A1, C1, C5, E1	WEB SITES: LIVE from Antarctica: **http://passport.ivv.nasa.gov/antarctica/tg/ready.html** Life in Antarctic Lesson Plan: **http://passport.ivv.nasa.gov/antarctica/tg/program2.html**
⑥ Design, develop, publish, and present products (e.g., Web pages and videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5 ,6)	▷ Use the Internet to investigate the ozone layer in Antarctica. Compare the Antarctic ozone layer to the ozone layer where students live. Create a graph showing the comparison or build a 3-D model using software. Make predictions about the future of the ozone layer. Use video, presentation, or multimedia-authoring software to design a public service announcement on ozone, comparing local and Antarctic values.	ELA 4, 5, 6, 8, 11, 12 MATH 2, 4, 5, 6, 8, 9, 10 5–8 SCI A1, B3, D1, D3, F4, F5	SOFTWARE: Multimedia-authoring Graphing Web page creation Digital art HARDWARE: Video camcorder VCR

	▷ Create a Web-page field guide to animals in the Antarctic food web. Include penguins, pinnipeds (seals), cetaceans (whales and dolphins), crustaceans (krill), fish, and birds.	ELA 4, 8, 12 IL 1, 2, 3 MATH 2, 10 5–8 SCI A1, C4, C5, E1	WEB SITES: Gas Concentrations–Ozone: **http://acd.ucar.edu/~zchu/data/data111.htm** Scientific Committee on Antarctic Research: **www.antcrc.utas.edu.au/scar/** Data Product–Ozone: **http://toms.gsfc.nasa.gov/ozone/ozone01.html** ICAIR: **www.icair.iac.org.nz/** International Antarctic Centre: **www.iceberg.co.nz/** Mount Erebus Volcanic Observatory: **www.ees.nmt.edu/Geop/erebus.html**
	▷ Study Mount Erebus. Create a multimedia presentation about this volcano. Include the following information: its type and structure, its importance in polar plate tectonics, the threat it presents to the health of the ecosystem, toxic gas emissions (provide a graph), and seismic activities.	ELA 4, 5, 6, 8, 12 IL 5 MATH 2, 4, 9, 10 5–8 SCI B1, D1, E1 SS III	
	▷ Create an animated presentation on plate tectonics illustrating how Antarctica separated from the larger continents and moved to its current position.	ELA 3, 8 5–8 SCI B2, B3, D1, D2	
⑦ Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)	▶ Track the U.S. Coast Guard ships The Polar Star and The Polar Sea on a map using coordinate graphing. Communicate with these ships using e-mail to get details on one of their missions. Use multimedia-authoring software to create an animated presentation of their journey.	ELA 3, 4, 5, 6 IL 1, 3, 5 MATH 3, 4, 5, 8, 9 5–8 SCI A1, D1 SS III	WEB SITES: USCG Polar Sea: **www.oz.net/~polarsea/** Polar Star: **www.polarstar.org/**

⑧ Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)	▷ Research the following questions: How does latitude affect weather? Which aspects of weather (temperature, rainfall, and so forth) can and cannot be predicted by latitude? Use data from Antarctica, student cities, and other points in between to support findings. Select an appropriate and compelling way to display the findings.	ELA 1, 3, 4, 5, 8, 11 IL 1, 3, 5 MATH 4, 5, 8, 9 5–8 SCI A1, A2, D1, E2 SS III	WEB SITES: U.S. Antarctic Program: **http://adelie.asa.org/htm**
⑨ Demonstrate an understanding of concepts underlying hardware, software, and connectivity, and of practical applications to learning and problem solving. (1, 6)	▷ Select a piece of machinery or technology that is used or could be used to make Antarctica livable (e.g., a snow "cat" or an ice auger). Use Robolab LEGO Mindstorms sets to create a working model for the machinery or technology. The model, although different in scale, should operate on the same principles as the actual machine.	5–8 SCI E1, E2	SOFTWARE: Robolab: LEGO Mindstorms Sets for Schools WEB SITE: LIVE from Antarctica: **http://passport.ivv.nasa.gov/antarctica/background/NSF/** OTHER: LEGOs
	▷ Investigate the ways in which scientists in Antarctica are connected through the Internet to the classroom computer. Research emerging technologies and make recommendations for the ways technologies might connect 10 years from now.	ELA 8 5–8 SCI E1, E2 SS VII	
⑩ Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)	▷ Research several sites on the Internet that discuss the ozone layer. Prepare an analysis of each site's accuracy, relevance, appropriateness, comprehensiveness, and possible bias. Present this information in a Web page with links to the source material.	ELA 4, 6, 11, 12 MATH 2, 4, 5, 6, 8, 9, 10 5–8 SCI A1, B3, D1, D3, F4, F5	WEB SITES: Gas Concentrations—Ozone: **http://acd.ucar.edu/~zchu/data/data111.htm** Scientific Committee on Antarctic Research: **www.antcrc.utas.edu.au/scar/** Data Product—Ozone: **http://toms.gsfc.nasa.gov/ozone/ozone01.html**

Credits: Debbie Silver, James Wiebe, Roland Garcia, James Klein, Vivian Meiers, Dennis O'Connor, Jim Schultz, and Melanie Sprouse

Notes:

Innovations: Past, Present, Future

Secondary Grades 9–12

Technological innovations do more than make things convenient. They arise from need, mistakes, and historical events. They affect history, capture our imagination, shape our language, and allow us to apply and extend our theoretical knowledge.

Using one invention from the past as a metaphor, students examine the importance of that innovation. They then examine the potential impact of both an emerging technology and a future invention. The teacher can use any important past invention and choose hypothetical future inventions, or students can identify specific needs and design their own innovations.

Specific Web sites are usually not supplied in these activities because searching for the material is an important subtext to the project. Teachers can examine the following Web sites for background material:

Invention and Technology: **www.proteacher.com/110031.shtml**
20th-Century Inventors and Inventions: **www.mthhs.mtlib.org/pd_invent.html**
Learning Resources: **www.stjohns.k12.fl.us/cl/invent.html**

NETS Performance Indicators *Prior to completion of Grade 12, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Identify capabilities and limitations of contemporary and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. (2)	▷ Generate a concept map about the invention of the telephone. Research topics from the map and contribute digitized material (video interviews, scanned pictures, text, and graphic information) to a class archive.	ELA 1, 2, 3, 7 IL 2, 6 *9–12 SCI B6, D4, E2, G1, G3	SOFTWARE: Concept-mapping Word-processing Multimedia-authoring TimeLiner Graphing HARDWARE: Graphing calculator Scanner Video camcorder Analog and digital video (CD-ROM, DVD) Laserdiscs
	▷ Keep a journal of Alexander Graham Bell's progress toward the completion of his invention. (Bell's original journal is available on the American Memory Web site.)	ELA 1, 3, 5, 7, 8 9–12 SCI A1, E2, G1 SS II, VIII	
	▷ Determine the origin of the name of an invention as well as the origin of the name of its inventor.	ELA 3, 6, 7, 8 FL 2.2, 3.1 SS II, III	
	▷ Plot and model the growth of the use of an invention. Predict when the invention will be "everywhere."	ELA 3, 5 MATH 2, 4, 5, 8 9–12 SCI A1, E1, E2 SS II, VII	

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*Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s)

	▶ Examine important mathematical ideas used in the development of an invention.	MATH 7, 8, 9, 10 9–12 SCI A2	WEB SITES: Inventors: **www.si.edu/lemelson/centerpieces/whole_cloth/frame1.html** Alexander Graham Bell Institute: **http://bell.uccb.ns.ca/** Historic Sites: **www.capebretonet.com/AGBell.html** Yahooligans Directory–A.G. Bell: **www.yahooligans.com/Science_and_Oddities/Scientists/Bell_Alexander_Graham/** NASA: **http://quest.arc.nasa.gov/** American Memory: **http://lcweb2.loc.gov/ammem/ammemhome.html**
	▶ Examine the ways in which an invention contributed to or changed the discipline of mathematics.	ELA 7, 8 MATH 8, 9	
	▶ Create a multimedia timeline of the Industrial Age. The timeline should include major inventions of the Industrial Age as well as social, economic, and political aspects of the era.	IL 6 9–12 SCI G3 SS II, V, VI, X	
	▶ Examine the cellular technology used by phone companies. Look at the distance limitations of cellular technology. Explain why there are so many cellular towers in cities.	ELA 1 MATH 4, 9 9–12 SCI B6, E2, F6	
	▶ Research and examine communication technologies related to the quest for information about our solar system and universe. Explore the research questions: How long does it take to communicate with satellites, space-based robots, or astronauts, based on their distance from earth? What media are available for such communication?	ELA 7, 8 MATH 4, 9 9–12 SCI B6, D1, F6	
② Make informed choices among technology systems, resources, and services. (1, 2)	▷ Design a way to organize and examine the archived material on Web sites covering the previous topic. Choose the most appropriate technology for class presentations on the results of their knowledge navigation.	ELA 8 IL 6 MATH 8 9–12 SCI E1 SS VIII	SOFTWARE: Presentation Multimedia-authoring WEB SITES: Same as previous activity

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③ Analyze advantages and disadvantages of widespread use and reliance on technology in the workplace and in society as a whole. (2)	▶ After students have given presentations, make a graphic representation of the positive and negative results of the invention of the telephone.	ELA 1, 3, 7 MATH 5, 6, 8, 9, 10 9–12 SCI E1, F6 SS I, II, III, VII, VIII, IX	SOFTWARE: Presentation Word-processing Spreadsheet HARDWARE: VCR Audiotape player WEB SITE: PBS Online: www.pbs.org/
	▶ Show how the invention of the telephone has changed relationships between people (e.g., How has it made the world "smaller?"). What are the disadvantages for the blind? Contact a local office for the deaf and blind and request a demonstration of adaptive technologies.	ELA 4, 7, 8 FL 2.1, 5.1 IL 2, 6 9–12 SCI E2, F6 SS III, IV, V, VI	
	▶ Create a presentation to illustrate the impact of the telephone on various populations of people with disabilities (i.e., deaf, blind, and physically disabled). Describe how the quality of their lives have changed because of the telephone.	ELA 5 9–12 SCI G1 SS II, IV, VII, VIII	
	▶ Explore and take notes on the PBS Web page dedicated to the invention of the telephone. After listening to audio interviews with some of the first "Hello Girls" (operators), develop a list of interview questions. Conduct oral history interviews with community and family members.	ELA 7, 8, 9 9–12 SCI B6, E2, G1, G3 SS II, III, IV, V	
	▶ Explore analytical questions such as: What impact did the invention of the telephone have on social, political, and judicial aspects of life? Think about the issue of overhearing a telephone conversation. What might this do to certain relationships? Would information gathered in this way be admissible in court?	ELA 7, 8 IL 2, 6 9–12 SCI E2, G1, G3 SS II, III IV, V, VI, X	
	▶ Collectively propose a new invention. (The teacher might want to assign a hypothetical invention, e.g., a Star Trek-type teleporting device or hologram that projects "telephones.") In cooperative groups, develop statements regarding the social and economic impact on society of	ELA 4, 5, 7, 8, 11 MATH 6 9–12 SCI A1, A2, E2, G2 SS IV, V, VI, VIII, IX, X	

	this innovative technology. Students in the collaborating groups need not be from the same classroom or school building.		
④ Demonstrate and advocate legal and ethical behaviors among peers, family, and community regarding the use of technology and information. (2)	▶ Archive research material with appropriate credits and citations.	ELA 2, 7 IL 2, 6, 8	SOFTWARE: Graphing Word-processing Spreadsheet HARDWARE: Graphing calculators OTHER: MLA, U.S. Copyright Office
	▶ Plot and model the cost of the invention to end users.	MATH 2, 5, 6, 8, 10	
	▶ Examine the costs and benefits involved with the invention, and explain how the costs and benefits might have changed the economic class structure.	MATH 6, 8, 10 9–12 SCI E2, G1 SS VII	
	▶ Research the U.S. Patent Office's role during the Industrial Revolution. Compare and contrast policies from the turn of the 19th century with modern-day policies.	ELA 2, 7, 8 IL 2 9–12 SCI E2 SS VI	
⑤ Use technology tools and resources for managing and communicating personal and professional information (e.g., finances, schedules, addresses, purchases, and correspondence). (3, 4)	▶ Have students share with other class members and collaborative groups the progress they have made in their research. Share ideas for knowledge navigation.	ELA 8, 11	SOFTWARE: Word-processing Spreadsheet Graphing Videoconferencing
	▶ Contact local telephone company to gather the number and cumulative monthly costs of local and long distance telephone calls, faxes, and beeper messages. Graph and display the results.	MATH 2, 5, 9 SS VII	
⑥ Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)	▷ As an inventor-mentor project, connect through telecommunications with current inventors or U.S. Patent Office representatives to learn about the process of inventing and the impact different inventions have had on society.	ELA 3, 4, 5, 6, 12 9–12 SCI E2, G1 SS II, VII, VIII	SOFTWARE: Concept-mapping Presentation Multimedia-authoring Videoconferencing

	▶ Consider several methods (e.g., e-mail, conferencing, Web site, videoconferencing, face-to-face) and choose the best for building group collaboration in research, communication, and presentation among students in physically separated schools. Articulate the reasoning used to arrive at the conclusion.	**ELA 1, 3, 6, 7, 8** **IL 7, 8, 9** **9–12 SCI A1, A2, B1, E2, G1** **SS V, VIII**	HARDWARE: Telephone with long-distance capability
⑦ Routinely and efficiently use online information resources to meet needs for collaboration, research, publications, communications, and productivity. (4, 5, 6)	▶ Use digital archives to research the invention of the telephone. Synthesize the information into a WebQuest.	**ELA 1, 2, 7, 8** **FL 4.2** **9–12 SCI A1, E2, F6, G1, G2** **SS II, VIII**	SOFTWARE: Spreadsheet Word-processing Presentation Multimedia-authoring HARDWARE: Video camcorder Scanner Digital camera WEB SITES: The WebQuest Page: **http://edweb.sdsu.edu/webquest/webquest.html** American Memory: **http://lcweb2.loc.gov/ammem/mcchtml/** epals Classroom Exchange: **www.epals.com/** Global Schoolhouse: **www.gsn.org/project/index.html** Intercultural E-Mail Classroom Connections: **www.stolaf.edu/network/iecc/**
	▶ In collaborative groups, develop a method for data collection that will identify the "most important" communications technology for the following generations: grandparents, parents, and peers.	**ELA 4, 7, 8, 9** **FL 2.1, 5.1** **IL 9** **MATH 5, 8** **9–12 SCI A1, E2, G1** **SS I, II, VIII**	
	▶ Compare the U.S. with other countries regarding the number of phones per person. The information can be gathered by connecting with other classrooms around the world or consulting the research department of a local telephone company. The data can be displayed in many forms, including charts in class presentations.	**MATH 5, 8** **FL 2.2, 5.1** **IL 2, 3** **SS VIII**	

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			Global Rigby: www.reedbooks.com.au/rigby/global/keypal.html Web66: http://web66.coled.umn.edu/ Penpal Class Box: www.ks-connection.org/
⑧ Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)	▶ Design an approach to organizing and retrieving archived material (i.e., knowledge navigation). Choose the most appropriate technology to present the results of knowledge navigation to the class.	ELA 3, 7, 8, 9 9–12 SCI A1, A2, E2	SOFTWARE: Word-processing Presentation Multimedia-authoring TimeLiner
	▶ Use appropriate research tools to investigate the historical significance of the invention of the telephone. Identify emerging technologies in the field of communication and hypothesize about the effects these technologies have on people's lives.	ELA 7, 8 IL 7, 8 9–12 SCI G3 SS II, VIII	
	▶ Beginning with the telephone, create a timeline of inventions of assistive devices for persons with disabilities. Describe the transformation of the telephone into telecommunication devices for the deaf (TDDs).	ELA 7, 8 9–12 SCI A1, A2, E1 SS II	
⑨ Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)	▶ Describe a hypothetical invention and analyze its potential impact. Write a story, play, or a series of fictional newspaper accounts, set in the future, based on the hypothetical invention.	ELA 4, 5, 8, 12 MATH 3, 9 9–12 SCI A1, A2 SS II, VIII	SOFTWARE: Web page creation Word-processing Digital art

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	▷ Work in teams to design a museum of the Industrial Age. The museum should accurately reflect the events and significance of the Industrial Age. Design the building then select materials for display.	ELA 1, 2, 3, 7, 8 IL 7, 8, 9 SS II, VIII	
	▶ Work in teams to propose and develop a 3-D model of a "next-generation" communication technology that might affect the current generation and the next generation. Encourage students to develop "telementor" relationships.	ELA 4 FL 1.1 9–12 SCI A1, A2, E1, E2 SS II, V, VIII	
⑩ Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)	▶ Contribute digitized material (video interviews, scanned pictures, text, and graphic information) to a class archive and create links to resource material.	ELA 2, 3, 4, 7, 8, 12 FL 1.1, 1.2, 1.3, 4.2	SOFTWARE: Word-processing Database Multimedia encyclopedias Graphics TimeLiner Multimedia-authoring HARDWARE: Scanner Digital camera WEB SITES: epals Classroom Exchange: **www.epals.com/** Global Schoolhouse: **www.gsn.org/project/index.html** Intercultural E-Mail Classroom Connections: **www.stolaf.edu/network/iecc/**
	▶ Consider several methods and choose the best for building group collaboration in research, communication, and presentation among students in physically separated schools. Articulate the reasoning used to arrive at a conclusion.	ELA 1, 3, 6, 7, 8 FL 1.1 IL 7, 8, 9 9–12 SCI A1, A2, E1, E2, G1 SS V, VIII	
	▶ Collaborate with "telepartners." Use a Web-based multimedia presentation to present future inventions to peers in other schools (possibly in other states or countries). Conduct e-mail interviews to hypothesize about the impact future inventions will have on the world.	ELA 4, 5, 7, 8 FL 1.1, 1.2, 1.3 IL 9 9–12 SCI E1, E2, G1, G3 SS I, III	

▶ Research and report on at least three "scientific breakthroughs" that enabled communications technology to have a widespread impact. A description of the supporting technology can include the inventor, the date of the invention, and a description or rationale of why it was a "breakthrough" technology.	ELA 1, 2, 3, 4, 5, 7, 8 IL 2, 3, 6 9–12 SCI G1, G2, G3 SS II	Global Rigby: **www.reedbooks.com.au/rigby/global/keypal.html** Web66: **http://web66.coled.umn.edu/** Penpal Class Box: **www.ks-connection.org/** AskJeeves: **www.askjeeves.com/** NASA Ask-a-Scientist: **http://quest.arc.nasa.gov/**
▶ Use word-processing software to create a telephone conversation between A.G. Bell and his deaf wife. Research the use of English, colloquialisms, and other language elements of the time period.	ELA 1, 3, 4, 5, 7, 8	

Credits: Harriet Taylor, David Barr, David Moursund, Gordon Dahlby, Carla Fenner, Scott Kirst, Merner Leipolt, Cheryl Mason, and Bernard Ricca

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When Does Data Become Knowledge?

Secondary Grades 9–12

With the advent of instantaneous electronic information, students at the secondary level are able to access primary source information on-demand. Students can become "experts" and keep up-to-date on the latest developments. In this unit, students learn to discern between statements that simply repeat data or information and ones that represent true knowledge and wisdom.

Students are provided with a scenario about a proposed new wrist-pad technology:
If you had unlimited access to stored data and information, what would you do with it? What tools would you need to analyze and organize it? How much of it would you need to memorize? Hypothesize that you are given a computer wrist-pad of virtually unlimited storage capacity. You can use this computer on every test you take, and in every interview and meeting you attend.

Through exploration of a self-selected topic, cooperative groups research a topic and come to conclusions about the type of information available on it. They also decide how to differentiate between uninterpreted data and wisdom. Through the unit activities, students learn what type of information is kept on a computer, how it is organized, and how valuable it is compared to what is stored in their cerebral storage system—their brains! The unit concludes with a multimedia explanation of the topic, reflecting on: What is storable data used for reference? What is information requiring some level of interpretation? What is knowledge, and how it is acquired? What is considered wisdom and how is it recorded and stored? The class reflects on what it takes to be an "expert" on a subject, and concludes with a self-analysis of their own presentations, comparing themselves with the class definition of "expert."

Note: The topic selected for study by students can be based on students' career choices or narrowed to topics within specified themes.

NETS Performance Indicators *Prior to completion of Grade 12, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Identify capabilities and limitations of contemporary and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. (2)	Decide on the type of technologies they need in their search for information on their topic. Articulate the criteria for choosing the technologies. Examples include: ▶ Making a PowerPoint presentation ▶ Designing a Web page ▶ Using a video camcorder to document places where the idea takes place	ELA 1, 4, 5, 6, 7, 8, 12 MATH 2, 5, 6, 10 SS I, II, III, VIII	SOFTWARE: Presentation Multimedia-authoring Web page creation Database HARDWARE: Video camcorder Audiotape player

	▷ Conducting research on the aspects of the project that can be implemented with current technology ▷ Collecting oral histories from people involved		
② Make informed choices among technology systems, resources, and services. (1, 2)	Individually or in groups, select appropriate technologies for various types of presentations on a topic. Examples include: ▷ Create a listserv on techniques or current information ▷ Review related software ▷ Create a bibliography with explanations of why the books are the best ones ▷ Survey art that depicts the topic or has the topic as a theme ▷ Design a facility that houses researchers studying the topic. Where would the facility be located? What would be the necessary design characteristics of the facility? ▷ Create a unique presentation. For example, if the topic is pop vocal music, a presentation can be created using music to convey the information.	**ELA 1, 4, 5, 6, 7, 8, 12** **MATH 5, 6, 9** **9–12 SCI G1** **SS I, III, VIII**	SOFTWARE: Word-processing Database CAD or graphics WEB SITES: Software databases (e.g., California Instructional Technology Clearinghouse: **http://clearinghouse.k12.ca.us/**) Educational Software Preview Guide: **http://wfm.sd38.bc.ca:8005/ESP/** OTHER: Access to a Webmaster or mailing list creator
③ Analyze advantages and disadvantages of widespread use and reliance on technology in the workplace and in society as a whole. (2)	Help students articulate why they want to analyze particular types of information. Sample questions to address include: ▷ What periodicals related to the topic are no longer published in print form or no longer exist? Is the information available another way?	**ELA 1, 2, 3, 8** **9–12 SCI G2** **SS VII, VIII**	SOFTWARE: Word-processing

	▶ If the use of wrist computers becomes widespread, why produce print materials at all? ▶ What are the copyright laws protecting information on the wrist computer? ▶ Is it cheating to use a computer when taking a test on the chosen topic? (Write a paper or develop a presentation on this issue.) ▶ What effect does the chosen topic have on different societies and cultures? ▶ Have different cultures or countries in different periods of history held different views on what constitutes a high level of expertise on the chosen topic?		
④ Demonstrate and advocate legal and ethical behaviors among peers, family, and community regarding the use of technology and information. (2)	Demonstrate ethical behaviors when seeking and using resources on the topic. Examples of activities include: ▶ Investigate community laws and policies that influence the topic. How is legal and illegal behavior defined with respect to the topic? ▶ Evaluate the role government plays in regulating activities related to the topic. Write letters to government officials and attend government meetings to get information. ▶ Sample information from the Internet that explains what makes a good Web site. Sample information that explains what makes the quality of data on a Web site good.	ELA 4, 5, 6, 7, 8, 12 SS I, III, IV, V, VIII, X	SOFTWARE: Word-processing WEB SITES: Search for Web site evaluation criteria (consult the state educational technology Web site) Search for information on plagiarism (see major college Web sites) Search for intellectual property rights (contact a local law firm specializing in IPR)

	▷ Discuss what it feels like when someone taps into someone else's personal database and copies data from it. What rules or guidelines should be established?		OTHER: State law database (contact the local bar association)
⑤ Use technology tools and resources for managing and communicating personal and professional information (e.g., finances, schedules, addresses, purchases, and correspondence). (3, 4)	Develop a Web site on the chosen topic. Identify the technology needed to organize and present data related to the chosen topic. Examples include: ▷ Spreadsheet for organizing the site ▷ Database to organize information on public policy and to store personal contact information ▷ Charts for showing allocation of resources or other pertinent information	ELA 1, 4, 5, 7, 8, 12 MATH 1, 2, 3, 5, 8, 9, 10 9–12 SCI F6 SS III, VI, X	SOFTWARE: Word-processing Database Spreadsheet Web page creation Graphing
⑥ Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)	Decide what information is needed to become or remain an expert on the topic, throughout life. For example, if the topic involves fishing, information discussed might include: ▷ Downloads from Web sites on chemistry, biology, the physics of fishing, and information on poles and lures ▷ Scientific information to help predict the future of fishing, including the identification of places for good fishing if global warming continues ▷ Patterns of change, including identifying changes in the behavior of fish or mapping changes in migratory patterns	ELA 4, 7, 8, 12 MATH 2, 5, 8, 9 9–12 SCI F2, F3, F4, G1, G2 SS III	SOFTWARE: Word-processing Database Spreadsheet Web page creation Graphing

⑦ Routinely and efficiently use online information resources to meet needs for collaboration, research, publications, communications, and productivity. (4, 5, 6)	Determine the best way to gather, manage, and share the collected information. Examples include: ▶ Find resources needing daily, weekly, or monthly updating. ▶ Use e-mail or videoconferencing with experts in the field to stay current. ▶ Discuss how to communicate a vast amount of information to other people. How is knowledge disseminated? ▶ Determine how to take advantage of the work of other people who are developing and organizing their own databases. Determine how information can be shared among differently structured databases.	ELA 4, 7, 8, 12 MATH 8, 9 SS I, III, VII, IX	SOFTWARE: Internet Web browser Web-capturing (Web Buddy, WebWhacker)
⑧ Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)	Determine the type of analysis necessary for the information collected. For example, if the topic is abstract painting, examples include: ▷ Research current artists in the field and create a database with pertinent information ▷ Hold videoconferences with agents, gallery managers, and others to gain a business perspective ▷ Maintain a budget of expenses related to music production and other costs ▷ Analyze performances of both past and present popular artists to find commonalties of success	ELA 8, 12 MATH 2, 5, 8, 9, 10 9–12 SCI C3, C4, C6	SOFTWARE: Spreadsheet Database Word-processing Videoconferencing HARDWARE: VCR

⑨ Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)	Using other models, analyze types of classification systems that might be used to categorize information. Examples include: ▷ Web strategies similar to those used by Yahoo! ▷ Classification systems like those used in life sciences ▷ Techniques using artificial intelligence in the chosen area of expertise. Identify current limitations and capabilities of artificial intelligence in the given area.	ELA 4, 7, 8, 12 MATH 2, 8, 9, 10 9–12 SCI G2 SS III	SOFTWARE: Database Word-processing
⑩ Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)	Use class discussion to obtain input and suggestions from other students. Assess each other's projects using the teacher- and student-developed definition of an expert suggested in the introduction. Assess projects in terms of content and delineation of the topic. Assess the progress from data to knowledge to wisdom. Examples of outcomes include: ▷ Rubrics of the presentation ▷ Student-designed Web pages ▷ Group review of an oral presentation ▷ Out-of-school evaluations by parents, adults, businesspeople, professionals, and others	ELA 4, 5, 6, 7, 8, 12 MATH 8 9–12 SCI A2 SS III, V, VIII	SOFTWARE: Presentation Web page creation

Credits: Harriet Taylor, David Barr, David Moursund, Gordon Dahlby, Carla Fenner, Scott Kirst, Merner Leipolt, Cheryl Mason, and Bernard Ricca

Appendices

- A. Standards
- B. NETS Workshop Staging Guide
- C. NETS Project Partnership
- D. Resources

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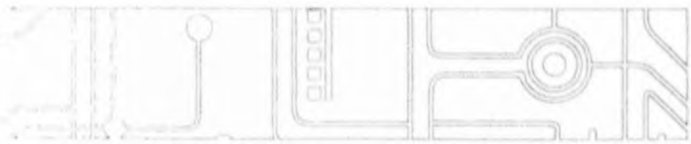
Appendix A

Standards

- NETS for Students
- English Language Arts
- Foreign Language
- Information Literacy
- Mathematics
- Science
- Social Studies



NETS for Students

1. **Basic operations and concepts**
   - *Students demonstrate a sound understanding of the nature and operation of technology systems.*
   - *Students are proficient in the use of technology.*
2. **Social, ethical, and human issues**
   - *Students understand the ethical, cultural, and societal issues related to technology.*
   - *Students practice responsible use of technology systems, information, and software.*
   - *Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.*
3. **Technology productivity tools**
   - *Students use technology tools to enhance learning, increase productivity, and promote creativity.*
   - *Students use productivity tools to collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works.*
4. **Technology communications tools**
   - *Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.*
   - *Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.*
5. **Technology research tools**
   - *Students use technology to locate, evaluate, and collect information from a variety of sources.*
   - *Students use technology tools to process data and report results.*
   - *Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks.*
6. **Technology problem-solving and decision-making tools**
   - *Students use technology resources for solving problems and making informed decisions.*
   - *Students employ technology in the development of strategies for solving problems in the real world.*

GRADES PREK–2

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 2 students will:

1. *Use input devices (e.g., mouse, keyboard, remote control) and output devices (e.g., monitor, printer) to successfully operate computers, VCRs, audiotapes, and other technologies. (1)*
2. *Use a variety of media and technology resources for directed and independent learning activities. (1, 3)*
3. *Communicate about technology using developmentally appropriate and accurate terminology. (1)*
4. *Use developmentally appropriate multimedia resources (e.g., interactive books, educational software, elementary multimedia encyclopedias) to support learning. (1)*
5. *Work cooperatively and collaboratively with peers, family members, and others when using technology in the classroom. (2)*
6. *Demonstrate positive social and ethical behaviors when using technology. (2)*
7. *Practice responsible use of technology systems and software. (2)*
8. *Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)*
9. *Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)*
10. *Gather information and communicate with others using telecommunications, with support from teachers, family members, or student partners. (4)*

GRADES 3–5

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 5 students will:

1. *Use keyboards and other common input and output devices (including adaptive devices when necessary) efficiently and effectively. (1)*
2. *Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide. (1, 2)*
3. *Discuss basic issues related to responsible use of technology and information and describe personal consequences of inappropriate use. (2)*
4. *Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)*
5. *Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)*
6. *Use telecommunications efficiently and effectively to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests. (4)*
7. *Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)*
8. *Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6)*
9. *Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)*
10. *Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources. (6)*

GRADES 6–8

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 8 students will:

1. *Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)*
2. *Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)*
3. *Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse. (2)*
4. *Use content-specific tools, software, and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3, 5)*
5. *Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)*
6. *Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)*
7. *Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)*
8. *Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)*
9. *Demonstrate an understanding of concepts underlying hardware, software, and connectivity, and of practical applications to learning and problem solving. (1, 6)*
10. *Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)*

GRADES 9–12

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 12 students will:

1. *Identify capabilities and limitations of contemporary and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. (2)*
2. *Make informed choices among technology systems, resources, and services. (1, 2)*
3. *Analyze advantages and disadvantages of widespread use and reliance on technology in the workplace and in society as a whole. (2)*
4. *Demonstrate and advocate for legal and ethical behaviors among peers, family, and community regarding the use of technology and information. (2)*
5. *Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)*
6. *Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)*
7. *Routinely and efficiently use online information resources to meet needs for collaboration, research, publication, communication, and productivity. (4, 5, 6)*
8. *Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)*
9. *Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)*
10. *Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)*

English Language Arts Standards

The vision guiding these standards is that all students must have the opportunities and resources to develop the language skills they need to pursue life's goals and to participate fully as informed, productive members of society. These standards assume that literacy growth begins before children enter school as they experience and experiment with literacy activities—reading and writing, and associating spoken words with their graphic representations. Recognizing this fact, these standards encourage the development of curriculum and instruction that make productive use of the emerging literacy abilities that children bring to school. Furthermore, the standards provide ample room for the innovation and creativity essential to teaching and learning. They are not prescriptions for particular curricula or instruction.

Although we present these standards as a list, we want to emphasize that they are not distinct and separable; they are, in fact, interrelated and should be considered as a whole.

1. *Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.*
2. *Students read a wide range of literature from many periods in many genres to build an understanding of the many dimensions (e.g., philosophical, ethical, and aesthetic) of human experience.*
3. *Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, and graphics).*
4. *Students adjust their use of spoken, written, and visual language (e.g., conventions, style, and vocabulary) to communicate effectively with a variety of audiences and for different purposes.*
5. *Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.*
6. *Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.*
7. *Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.*

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8. *Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, and video) to gather and synthesize information and to create and communicate knowledge.*
9. *Students develop an understanding of and respect for diversity in language use, patterns, and dialects across cultures, ethnic groups, geographic regions, and social roles.*
10. *Students whose first language is not English make use of their first language to develop competency in the English language arts and to develop understanding of content across the curriculum.*
11. *Students participate as knowledgeable, reflective, creative, and critical members of a variety of literacy communities.*
12. *Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).*

Foreign Language Standards

STATEMENT OF PHILOSOPHY

Language and communication are at the heart of the human experience. The United States must educate students who are linguistically and culturally equipped to communicate successfully in a pluralistic American society and abroad. This imperative envisions a future in which all students will develop and maintain proficiency in English and at least one other language, modern or classical. Children who come to school from non-English backgrounds should also have opportunities to develop further proficiencies in their first language.

STANDARDS FOR FOREIGN LANGUAGE LEARNING

Communication—Communicate in Languages Other than English

Standard 1.1:

Students engage in conversations, provide and obtain information, express feelings and emotions, and exchange opinions.

Standard 1.2:

Students understand and interpret written and spoken language on a variety of topics.

Standard 1.3:

Students present information, concepts, and ideas to an audience of listeners or readers on a variety of topics.

Cultures—Gain Knowledge and Understanding of Other Cultures

Standard 2.1:

Students demonstrate an understanding of the relationship between the practices and perspectives of the culture studied.

Standard 2.2:

Students demonstrate an understanding of the relationship between the products and perspectives of the culture studied.

Connections—Connect with Other Disciplines and Acquire Information

Standard 3.1:

Students reinforce and further their knowledge of other disciplines through the foreign language.

Standard 3.2:

Students acquire information and recognize the distinctive viewpoints that are only available through the foreign language and its cultures.

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Comparisons—Develop Insight into the Nature of Language and Culture

Standard 4.1:

Students demonstrate understanding of the nature of language through comparisons of the language studied and their own.

Standard 4.2:

Students demonstrate understanding of the concept of culture through comparisons of the cultures studied and their own.

Communities—Participate in Multilingual Communities at Home and Around the World

Standard 5.1:

Students use the language both within and beyond the school setting.

Standard 5.2:

Students show evidence of becoming lifelong learners by using the language for personal enjoyment and enrichment.

Information Literacy Standards

INFORMATION LITERACY

Standard 1:

The student who is information literate accesses information efficiently and effectively.

Standard 2:

The student who is information literate evaluates information critically and competently.

Standard 3:

The student who is information literate uses information accurately and creatively.

INDEPENDENT LEARNING

Standard 4:

The student who is an independent learner is information literate and pursues information related to personal interests.

Standard 5:

The student who is an independent learner is information literate and appreciates literature and other creative expressions of information.

Standard 6:

The student who is an independent learner is information literate and strives for excellence in information seeking and knowledge generation.

SOCIAL RESPONSIBILITY

Standard 7:

The student who contributes positively to the learning community and to society is information literate and recognizes the importance of information to a democratic society.

Standard 8:

The student who contributes positively to the learning community and to society is information literate and practices ethical behavior in regard to information and information technology.

Standard 9:

The student who contributes positively to the learning community and to society is information literate and participates effectively in groups to pursue and generate information.

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Mathematics Standards

STANDARD 1: NUMBER AND OPERATION

Mathematics instructional programs should foster the development of number and operation sense so that all students–

- ▷ understand numbers, ways of representing numbers, relationships among numbers, and number systems;
- ▷ understand the meaning of operations and how they relate to each other;
- ▷ use computational tools and strategies fluently and estimate appropriately.

STANDARD 2: PATTERNS, FUNCTIONS, AND ALGEBRA

Mathematics instructional programs should include attention to patterns, functions, symbols, and models so that all students–

- ▷ understand various types of patterns and functional relationships;
- ▷ use symbolic forms to represent and analyze mathematical situations and structures;
- ▷ use mathematical models and analyze change in both real and abstract contexts.

STANDARD 3: GEOMETRY AND SPATIAL SENSE

Mathematics instructional programs should include attention to geometry and spatial sense so that all students–

- ▷ analyze characteristics and properties of two- and three-dimensional geometric objects;
- ▷ select and use different representational systems, including coordinate geometry and graph theory;
- ▷ recognize the usefulness of transformations and symmetry in analyzing mathematical situations;
- ▷ use visualization and spatial reasoning to solve problems both within and outside of mathematics.

STANDARD 4: MEASUREMENT

Mathematics instructional programs should include attention to measurement so that all students–

- ▷ understand attributes, units, and systems of measurement;
- ▷ apply a variety of techniques, tools, and formulas for determining measurements.

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STANDARD 5: DATA ANALYSIS, STATISTICS, AND PROBABILITY

Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students—

- pose questions and collect, organize, and represent data to answer those questions;
- interpret data using methods of exploratory data analysis;
- develop and evaluate inferences, predictions, and arguments that are based on data;
- understand and apply basic notions of chance and probability.

STANDARD 6: PROBLEM SOLVING

Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students—

- build new mathematical knowledge through their work with problems;
- develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics;
- apply a wide variety of strategies to solve problems and adapt the strategies to new situations;
- monitor and reflect on their mathematical thinking in solving problems.

STANDARD 7: REASONING AND PROOF

Mathematics instructional programs should focus on learning to reason and construct proofs as part of understanding mathematics so that all students—

- recognize reasoning and proof as essential and powerful parts of mathematics;
- make and investigate mathematical conjectures;
- develop and evaluate mathematical arguments and proofs;
- select and use various types of reasoning and methods of proof as appropriate.

STANDARD 8: COMMUNICATION

Mathematics instructional programs should use communication to foster understanding of mathematics so that all students—

- organize and consolidate their mathematical thinking to communicate with others;
- express mathematical ideas coherently and clearly to peers, teachers, and others;
- extend their mathematical knowledge by considering the thinking and strategies of others;
- use the language of mathematics as a precise means of mathematical expression.

STANDARD 9: CONNECTIONS

Mathematics instructional programs should emphasize connections to foster understanding of mathematics so that all students—

- recognize and use connections among different mathematical ideas;
- understand how mathematical ideas build on one another to produce a coherent whole;
- recognize, use, and learn about mathematics in contexts outside of mathematics.

STANDARD 10: REPRESENTATION

Mathematics instructional programs should emphasize mathematical representations to foster understanding of mathematics so that all students—

- create and use representations to organize, record, and communicate mathematical ideas;
- develop a repertoire of mathematical representations that can be used purposefully, flexibly, and appropriately;
- use representations to model and interpret physical, social, and mathematical phenomena.

Science Standards

Grades K–4 Standards

CONTENT STANDARD A: SCIENCE AS INQUIRY

A1. Abilities necessary to do scientific inquiry:

- Ask a question about objects, organisms, and events in the environment.
- Plan and conduct a simple investigation.
- Employ simple equipment and tools to gather data and extend the senses.
- Use data to construct a reasonable explanation.
- Communicate investigations and explanations.

A2. Understanding about scientific inquiry:

- Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.
- Scientists use different kinds of investigations depending on the questions they are trying to answer.
- Simple instruments provide more information than scientists obtain using only their senses.
- Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge).
- Scientists make the results of their investigations public; they describe the investigations in ways that enable others to repeat the investigations.
- Scientists review and ask questions about the results of other scientists' work.

CONTENT STANDARD B: PHYSICAL SCIENCE

B1. Properties of objects and materials
B2. Position and motion of objects
B3. Light, heat, electricity, and magnetism

CONTENT STANDARD C: LIFE SCIENCE

C1. The characteristics of organisms
C2. Life cycles of organisms
C3. Organisms and environments

CONTENT STANDARD D: EARTH AND SPACE SCIENCE

D1. Properties of earth materials
D2. Objects in the sky
D3. Changes in earth and sky

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CONTENT STANDARD E: SCIENCE AND TECHNOLOGY

E1. Abilities of technological design
E2. Understanding about science and technology
E3. Abilities to distinguish between natural objects and objects made by humans

CONTENT STANDARD F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

F1. Personal health
F2. Characteristics and changes in populations
F3. Types of resources
F4. Changes in environments
F5. Science and technology in local challenges

CONTENT STANDARD G: HISTORY AND NATURE OF SCIENCE

G1. Science as a human endeavor:

- Science and technology have been practiced by people for a long time.
- Men and women have made a variety of contributions throughout the history of science and technology.
- Science will never be finished.
- Many people choose science as a career.

Grades 5–8 Standards

CONTENT STANDARD A: SCIENCE AS INQUIRY

A1. Abilities necessary to do scientific inquiry:

- Identify questions that can be answered through scientific investigations.
- Design and conduct a scientific investigation.
- Use appropriate tools and techniques to gather, analyze, and interpret data.
- Develop descriptions, explanations, predictions, and models using evidence and explanations.
- Recognize and analyze alternative explanations and predictions.
- Communicate scientific procedures and explanations.
- Use mathematics in all aspects of scientific inquiry.

A2. Understanding about scientific inquiry:

- Different kinds of questions suggest different kinds of scientific investigations.
- Current scientific knowledge and understanding guide scientific investigations.
- Mathematics is important in all aspects of scientific inquiry.
- Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.

- Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories.
- Science advances through legitimate skepticism.
- Scientific investigations sometimes result in new ideas and phenomena.

CONTENT STANDARD B: PHYSICAL SCIENCE

B1. Properties and changes of properties in matter
B2. Motion and forces
B3. Transfer of energy

CONTENT STANDARD C: LIFE SCIENCE

C1. Structure and function in living systems
C2. Reproduction and heredity
C3. Regulation and behavior
C4. Populations and ecosystems
C5. Diversity and adaptations of organisms

CONTENT STANDARD D: EARTH AND SPACE SCIENCE

D1. Structure of the earth system
D2. Earth's history
D3. Earth in the solar system

CONTENT STANDARD E: SCIENCE AND TECHNOLOGY

E1. Abilities of technological design:
  - Identify appropriate problems for technological design.
  - Design a solution or product.
  - Implement a proposed design.
  - Evaluate completed technological designs or products.
  - Communicate the process of technological design.

E2. Understanding about science and technology:
  - Scientific inquiry and technological design have similarities and differences.
  - Many different people in different cultures have made and continue to make contributions to science and technology.
  - Science and technology are reciprocal.
  - Perfectly designed solutions do not exist.
  - Technological designs have constraints.
  - Technological solutions have intended benefits and unintended consequences.

CONTENT STANDARD F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

F1. Personal health
F2. Populations, resources, and environments
F3. Natural hazards
F4. Risks and benefits
F5. Science and technology in society

CONTENT STANDARD G: HISTORY AND NATURE OF SCIENCE

G1. Science as a human endeavor:
  - Women and men of various social and ethnic backgrounds engage in the activities of science, engineering, and related fields.
  - Science requires different abilities.

G2. Nature of science:
  - Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models.
  - It is normal for scientists to differ with one another about the interpretation of the evidence or theory being considered.
  - It is part of scientific inquiry to evaluate ideas proposed by other scientists.

G3. History of science:
  - Many individuals have contributed to the traditions of science.
  - In historical perspective, science has been practiced by different individuals in different cultures.
  - Tracing the history of science can show how difficult it was for scientific innovators to break through the accepted ideas of their time to reach the conclusions that we currently take for granted.

Grades 9–12 Standards

CONTENT STANDARD A: SCIENCE AS INQUIRY

A1. Abilities necessary to do scientific inquiry:
  - Identify questions and concepts that guide scientific investigations.
  - Design and conduct a scientific investigation.
  - Use technology and mathematics to improve investigations and communications.
  - Formulate and revise scientific explanations and models using logic and evidence.
  - Recognize and analyze alternative explanations and models.
  - Communicate and defend a scientific argument.

A2. Understanding about scientific inquiry:

- Scientists usually inquire about how physical, living, or designed systems function.
- Scientists conduct investigations for a wide variety of reasons.
- Scientists rely on technology to enhance the gathering and manipulation of data.
- Mathematics is essential in scientific inquiry.
- Scientific explanations must adhere to criteria such as a proposed explanation must be logically consistent; it must abide by the rules of evidence; it must be open to questions and possible modification; and it must be based on historical and current scientific knowledge.
- Results of scientific inquiry emerge from different types of investigations and public communication among scientists.

CONTENT STANDARD B: PHYSICAL SCIENCE

B1. Structure of atoms
B2. Structure and properties of matter
B3. Chemical reactions
B4. Motions and forces
B5. Conservation of energy and increase in disorder
B6. Interactions of energy and matter

CONTENT STANDARD C: LIFE SCIENCE

C1. The cell
C2. Molecular basis of heredity
C3. Biological evolution
C4. Interdependence of organisms
C5. Matter, energy, and organization in living systems
C6. Behavior of organisms

CONTENT STANDARD D: EARTH AND SPACE SCIENCE

D1. Energy in the earth system
D2. Geochemical cycles
D3. Origin and evolution of the earth system
D4. Origin and evolution of the universe

CONTENT STANDARD E: SCIENCE AND TECHNOLOGY

E1. Abilities of technological design:

- Identify a problem or design an opportunity.
- Propose designs and choose between alternative solutions.
- Implement a proposed design.
- Evaluate the solution and its consequences.
- Communicate the problem, process, and solution.

E2. Understanding about science and technology:

- Scientists in different disciplines ask different questions, use different methods of investigation, and accept different types of evidence to support their explanations.
- Science often advances with the introduction of new technologies.
- Creativity, imagination, and a good knowledge base are all required in the work of science and engineering.
- Science and technology are pursued for different purposes.
- Technological knowledge is often not made public because of patents and the financial potential of the idea or invention. Scientific knowledge is made public.

CONTENT STANDARD F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

F1. Personal and community health
F2. Population growth
F3. Natural resources
F4. Environmental quality
F5. Natural and human-induced hazards
F6. Science and technology in local, national, and global challenges

CONTENT STANDARD G: HISTORY AND NATURE OF SCIENCE

G1. Science as a human endeavor:

- Individuals and teams have contributed and will continue to contribute to the scientific enterprise.
- Scientists have ethical traditions.
- Scientists are influenced by societal, cultural, and personal beliefs and ways of viewing the world.

G2. Nature of scientific knowledge:

- Science distinguishes itself from other ways of knowing and from other bodies of knowledge.
- Scientific explanations must meet certain criteria.
- Because all scientific ideas depend on experimental and observational confirmation, all scientific knowledge is, in principle, subject to change as new evidence becomes available.

G3. Historical perspectives:

- In history, diverse cultures have contributed scientific knowledge and technologic inventions.
- Usually, changes in science occur as small modifications in extant knowledge.
- Occasionally, there are advances in science and technology that have important and long-lasting effects on science and society.
- The historical perceptive of scientific explanations demonstrates how scientific knowledge changes by evolving over time, almost always building on earlier knowledge.

Social Studies Standards

PERFORMANCE EXPECTATIONS

I. Culture

Social studies programs should include experiences that provide for the study of culture and cultural diversity, so that the learner can:

EARLY GRADES

a. explore and describe similarities and differences in the ways groups, societies, and cultures address similar human needs and concerns;

b. give examples of how experiences may be interpreted differently by people from diverse cultural perspectives and frames of reference;

c. describe ways in which language, stories, folktales, music, and artistic creations serve as expressions of culture and influence behavior of people living in a particular culture;

d. compare ways in which people from different cultures think about and deal with their physical environment and social conditions;

e. give examples and describe the importance of cultural unity and diversity within and across groups.

MIDDLE GRADES

a. compare similarities and differences in the ways groups, societies, and cultures meet human needs and concerns;

b. explain how information and experiences may be interpreted by people from diverse cultural perspectives and frames of reference;

c. explain and give examples of how language, literature, the arts, architecture, other artifacts, traditions, beliefs, values, and behaviors contribute to the development and transmission of culture;

d. explain why individuals and groups respond differently to their physical and social environments and/or changes to them on the basis of shared assumptions, values, and beliefs;

e. articulate the implications of cultural diversity, as well as cohesion, within and across groups.

HIGH SCHOOL

a. analyze and explain the ways groups, societies, and cultures address human needs and concerns;

b. predict how data and experiences may be interpreted by people from diverse cultural perspectives and frames of reference;

c. apply an understanding of culture as an integrated whole that explains the functions and interactions of language, literature, the arts, traditions, beliefs and values, and behavior patterns;

d. compare and analyze societal patterns for preserving and transmitting culture while adapting to environmental or social change;

e. demonstrate the value of cultural diversity, as well as cohesion, within and across groups;

f. interpret patterns of behavior reflecting values and attitudes that contribute or pose obstacles to cross-cultural understanding;

g. construct reasoned judgments about specific cultural responses to persistent human issues;

h. explain and apply ideas, theories, and modes of inquiry drawn from anthropology and sociology in the examination of persistent issues and social problems.

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II. Time, Continuity, and Change

Social studies programs should include experiences that provide for the study of the ways human beings view themselves in and over time, so that the learner can:

EARLY GRADES

a. demonstrate an understanding that different people may describe the same event or situation in diverse ways, citing reasons for the differences in views;

b. demonstrate an ability to use correctly vocabulary associated with time such as past, present, future, and long ago; read and construct simple timelines; identify examples of change; and recognize examples of cause and effect relationships;

c. compare and contrast different stories or accounts about past events, people, places, or situations, identifying how they contribute to our understanding of the past;

d. identify and use various sources for reconstructing the past, such as documents, letters, diaries, maps, textbooks, photos, and others;

e. demonstrate an understanding that people in different times and places view the world differently;

f. use knowledge of facts and concepts drawn from history, along with elements of historical inquiry, to inform decision making about and action-taking on public issues.

MIDDLE GRADES

a. demonstrate an understanding that different scholars may describe the same event or situation in different ways but must provide reasons or evidence for their views;

b. identify and use key concepts such as chronology, causality, change, conflict, and complexity to explain, analyze, and show connections among patterns of historical change and continuity;

c. identify and describe selected historical periods and patterns of change within and across cultures, such as the rise of civilizations, the development of transportation systems, the growth and breakdown of colonial systems, and others;

d. identify and use processes important to reconstructing and reinterpreting the past, such as using a variety of sources, providing, validating, and weighing evidence for claims, checking credibility of sources, and searching for causality;

e. develop critical sensitivities such as empathy and skepticism regarding attitudes, values, and behaviors of people in different historical contexts;

f. use knowledge of facts and concepts drawn from history, along with methods of historical inquiry, to inform decision making about and action-taking on public issues.

HIGH SCHOOL

a. demonstrate that historical knowledge and the concept of time are socially influenced constructions that lead historians to be selective in the questions they seek to answer and the evidence they use;

b. apply key concepts such as time, chronology, causality, change, conflict, and complexity to explain, analyze, and show connections among patterns of historical change and continuity;

c. identify and describe significant historical periods and patterns of change within and across cultures, such as the development of ancient cultures and civilizations, the rise of nation-states, and social, economic, and political revolutions;

d. systematically employ processes of critical historical inquiry to reconstruct and reinterpret the past, such as using a variety of sources and checking their credibility, validating and weighing evidence for claims, and searching for causality;

e. investigate, interpret, and analyze multiple historical and contemporary viewpoints within and across cultures related to important events, recurring dilemmas, and persistent issues, while employing empathy, skepticism, and critical judgement;

f. apply ideas, theories, and modes of historical inquiry to analyze historical and contemporary developments, and to inform and evaluate actions concerning public policy issues.

III. People, Places, and Environments

Social studies programs should include experiences that provide for the study of people, places and environments, so that the learner can:

EARLY GRADES

a. construct and use mental maps of locales, regions, and the world that demonstrate understanding of relative location, direction, size, and shape;

b. interpret, use, and distinguish various representations of the earth, such as maps, globes, and photographs;

c. use appropriate resources, data sources, and geographic tools such as atlases, data bases, grid systems, charts, graphs, and maps to generate, manipulate, and interpret information;

d. estimate distances and calculate scale;

e. locate and distinguish among varying landforms and geographic features, such as mountains, plateaus, islands, and oceans;

f. describe and speculate about physical system changes, such as seasons, climate and weather, and the water cycle;

g. describe how people create places that reflect ideas, personality, culture, and wants and needs as they design homes, playgrounds, classrooms, and the like;

h. examine the interaction of human beings and their physical environment, the use of land, building of cities, and ecosystem changes in selected locales and regions;

i. explore ways that the earth's physical features have changed over time in the local region and beyond and how these changes may be connected to one another;

MIDDLE GRADES

a. elaborate mental maps of locales, regions, and the world that demonstrate understanding of relative location, direction, size, and shape;

b. create, interpret, use, and distinguish various representations of the earth, such as maps, globes, and photographs;

c. use appropriate resources, data, sources, and geographic tools such as aerial photographs, satellite images, geographic information systems (GIS), map projections, and cartography to generate, manipulate, and interpret information such as atlases, data bases, grid systems, charts, graphs, and maps;

d. estimate distance, calculate scale, and distinguish other geographic relationships such as population density and spatial distribution patterns;

e. locate and describe varying landforms and geographic features, such as mountains, plateaus, islands, rain forests, deserts, and oceans, and explain their relationships within the ecosystem;

f. describe physical system changes such as seasons, climate and weather, and the water cycle and identify geographic patterns associated with them;

g. describe how people create places that reflect cultural values and ideals as they build neighborhoods, parks, shopping centers, and the like;

HIGH SCHOOL

a. refine mental maps of locales, regions, and the world that demonstrates understanding of relative location, direction, size, and shape;

b. create, interpret, use, and synthesize information from various representations of the earth, such as maps, globes, and photographs;

c. use appropriate resources, data sources, and geographic tools such as aerial photographs, satellite images, geographic information systems (GIS), map projections, and cartography to generate, manipulate, and interpret information such as atlases, data bases, grid systems, charts, graphs, and maps;

d. calculate distance, scale, area, and density, and distinguish spatial distribution patterns;

e. describe, differentiate, and explain the relationships among various regional and global patterns of geographic phenomena such as landforms, soils, climate, vegetation, natural resources, and population;

f. use knowledge of physical system changes such as seasons, climate and weather, and the water cycle to explain geographic phenomena;

g. describe and compare how people create places that reflect culture, human needs, government policy, and current values and ideals as they design and build specialized buildings, neighborhoods, shopping centers, urban centers, industrial parks, and the like;

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III. People, Places, and Environments (continued)

EARLY GRADES

j. observe and speculate about social and economic effects of environmental changes and crises resulting from phenomena such as floods, storms, and drought;

k. consider existing uses and propose and evaluate alternative uses of resources and land in home, school, community, the region, and beyond.

MIDDLE GRADES

h. examine, interpret, and analyze physical and cultural patterns and their interactions, such as land use, settlement patterns, cultural transmission of customs and ideas, and ecosystem changes;

i. describe ways that historical events have been influenced by, and have influenced, physical and human geographic factors in local, regional, national, and global settings;

j. observe and speculate about social and economic effects of environmental changes and crises resulting from phenomena such as floods, storms, and drought;

k. propose, compare, and evaluate alternative uses of land and resources in communities, regions, nations, and the world.

HIGH SCHOOL

h. examine, interpret, and analyze physical and cultural patterns and their interactions, such as land use, settlement patterns, cultural transmission of customs and ideas, and ecosystem changes;

i. describe and assess ways that historical events have been influenced by, and have influenced, physical and human geographic factors in local, regional, national, and global settings;

j. analyze and evaluate social and economic effects of environmental changes and crises resulting from phenomena such as floods, storms, and drought;

k. propose, compare, and evaluate alternative policies for the use of land and other resources in communities, regions, nations, and the world.

IV. Individual Development and Identity

Social studies programs should include experiences that provide for the study of individual development and identity, so that the learner can:

EARLY GRADES

a. describe personal changes over time, such as those related to physical development and personal interests;

b. describe personal connections to place—especially place as associated with immediate surroundings;

c. describe the unique features of one's nuclear and extended families;

d. show how learning and physical development affect behavior;

e. identify and describe ways family, groups, and community influence the individual's daily life and personal choices;

f. explore factors that contribute to one's personal identity such as interests, capabilities, and perceptions;

g. analyze a particular event to identify reasons individuals might respond to it in different ways;

h. work independently and cooperatively to accomplish goals.

MIDDLE GRADES

a. relate personal changes to social, cultural, and historical contexts;

b. describe personal connections to place—as associated with community, nation, and world;

c. describe the ways family, gender, ethnicity, nationality, and institutional affiliations contribute to personal identity;

d. relate such factors as physical endowment and capabilities, learning, motivation, personality, perception, and behavior to individual development;

e. identify and describe ways regional, ethnic, and national cultures influence individuals' daily lives;

f. identify and describe the influence of perception, attitudes, values, and beliefs on personal identity;

g. identify and interpret examples of stereotyping, conformity, and altruism;

h. work independently and cooperatively to accomplish goals.

HIGH SCHOOL

a. articulate personal connections to time, place, and social/cultural systems;

b. identify, describe, and express appreciation for the influences of various historical and contemporary cultures on an individual's daily life;

c. describe the ways family, religion, gender, ethnicity, nationality, socioeconomic status, and other group and cultural influences contribute to the development of a sense of self;

d. apply concepts, methods, and theories about the study of human growth and development, such as physical endowment, learning, motivation, behavior, perception, and personality;

e. examine the interactions of ethnic, national, or cultural influences in specific situations or events;

f. analyze the role of perceptions, attitudes, values, and beliefs in the development of personal identity;

g. compare and evaluate the impact of stereotyping, conformity, acts of altruism, and other behaviors on individuals and groups;

h. work independently and cooperatively within groups and institutions to accomplish goals;

i. examine factors that contribute to and damage one's mental health and analyze issues related to mental health and behavioral disorders in contemporary society.

V. Individuals, Groups, and Institutions

Social studies programs should include experiences that provide for the study of interactions among individuals, groups, and institutions, so that the learner can:

EARLY GRADES

a. identify roles as learned behavior patterns in group situations such as student, family member, peer play group member, or club member;

b. give examples of and explain group and institutional influences such as religious beliefs, laws, and peer pressure, on people, events, and elements of culture;

c. identify examples of institutions and describe the interactions of people with institutions;

d. identify and describe examples of tensions between and among individuals, groups, or institutions, and how belonging to more than one group can cause internal conflicts;

e. identify and describe examples of tension between an individual's beliefs and government policies and laws;

f. give examples of the role of institutions in furthering both continuity and change;

g. show how groups and institutions work to meet individual needs and promote the common good, and identify examples of where they fail to do so.

MIDDLE GRADES

a. demonstrate an understanding of concepts such as role, status, and social class in describing the interactions of individuals and social groups;

b. analyze group and institutional influences on people, events, and elements of culture;

c. describe the various forms institutions take and the interactions of people with institutions;

d. identify and analyze examples of tensions between expressions of individuality and group or institutional efforts to promote social conformity;

e. identify and describe examples of tensions between belief systems and government policies and laws;

f. describe the role of institutions in furthering both continuity and change;

g. apply knowledge of how groups and institutions work to meet individual needs and promote the common good.

HIGH SCHOOL

a. apply concepts such as role, status, and social class in describing the connections and interactions of individuals, groups, and institutions in society;

b. analyze group and institutional influences on people, events, and elements of culture in both historical and contemporary settings;

c. describe the various forms institutions take, and explain how they develop and change over time;

d. identify and analyze examples of tensions between expressions of individuality and efforts used to promote social conformity by groups and institutions;

e. describe and examine belief systems basic to specific traditions and laws in contemporary and historical movements;

f. evaluate the role of institutions in furthering both continuity and change;

g. analyze the extent to which groups and institutions meet individual needs and promote the common good in contemporary and historical settings;

h. explain and apply ideas and modes of inquiry drawn from behavioral science and social theory in the examination of persistent issues and social problems.

VI. Power, Authority, and Governance

Social studies programs should include experiences that provide for the study of how people create and change structures of power, authority, and governance, so that the learner can:

EARLY GRADES

a. examine the rights and responsibilities of the individual in relation to his or her social group, such as family, peer group, and school class;

b. explain the purpose of government;

c. give examples of how government does or does not provide for needs and wants of people, establish order and security, and manage conflict;

d. recognize how groups and organizations encourage unity and deal with diversity to maintain order and security;

e. distinguish among local, state, and national government and identify representative leaders at these levels such as mayor, governor, and president;

f. identify and describe factors that contribute to cooperation and cause disputes within and among groups and nations;

g. explore the role of technology in communications, transportation, information-processing, weapons development, or other areas as it contributes to or helps resolve conflicts;

h. recognize and give examples of the tensions between the wants and needs of individuals and groups, and concepts such as fairness, equity, and justice.

MIDDLE GRADES

a. examine persistent issues involving the rights, roles, and status of the individual in relation to the general welfare;

b. describe the purpose of government and how its powers are acquired, used, and justified;

c. analyze and explain ideas and governmental mechanisms to meet needs and wants of citizens, regulate territory, manage conflict, and establish order and security;

d. describe the ways nations and organizations respond to forces of unity and diversity affecting order and security;

e. identify and describe the basic features of the political system in the United States, and identify representative leaders from various levels and branches of government;

f. explain conditions, actions, and motivations that contribute to conflict and cooperation within and among nations;

g. describe and analyze the role of technology in communications, transportation, information-processing, weapons development, or other areas as it contributes to or helps resolve conflicts;

h. explain and apply concepts such as power, role, status, justice, and influence to the examination of persistent issues and social problems;

i. give examples and explain how governments attempt to achieve their stated ideals at home and abroad.

HIGH SCHOOL

a. examine persistent issues involving the rights, roles, and status of the individual in relation to the general welfare;

b. explain the purpose of government and analyze how its powers are acquired, used, and justified;

c. analyze and explain ideas and mechanisms to meet needs and wants of citizens, regulate territory, manage conflict, establish order and security, and balance competing conceptions of a just society;

d. compare and analyze the ways nations and organizations respond to conflicts between forces of unity and forces of diversity;

e. compare different political systems (their ideologies, structure, and institutions, processes, and political cultures) with that of the United States, and identify representative political leaders from selected historical and contemporary settings;

f. analyze and evaluate conditions, actions, and motivations that contribute to conflict and cooperation within and among nations;

g. evaluate the role of technology in communications, transportation, information-processing, weapons development, or other areas as it contributes to or helps resolve conflicts;

h. explain and apply ideas, theories, and modes of inquiry drawn from political science to the examination of persistent issues and social problems;

i. evaluate the extent to which governments achieve their stated ideals and policies at home and abroad;

j. prepare a public policy paper and present and defend it before an appropriate forum in school or community.

VII. Production, Distribution, and Consumption

Social studies programs should include experiences that provide for the study of how people organize for the production, distribution, and consumption of goods and services, so that the learner can:

EARLY GRADES

a. give examples that show how scarcity and choice govern our economic decisions;

b. distinguish between needs and wants;

c. identify examples of private and public goods and services;

d. give examples of the various institutions that make up economic systems such as families, workers, banks, labor unions, government agencies, small businesses, and large corporations;

e. describe how we depend upon workers with specialized jobs and the ways in which they contribute to the production and exchange of goods and services;

f. describe the influence of incentives, values, traditions, and habits on economic decisions;

g. explain and demonstrate the role of money in everyday life;

h. describe the relationship of price to supply and demand;

MIDDLE GRADES

a. give and explain examples of ways that economic systems structure choices about how goods and services are to be produced and distributed;

b. describe the role that supply and demand, prices, incentives, and profits play in determining what is produced and distributed in a competitive market system;

c. explain the difference between private and public goods and services;

d. describe a range of examples of the various institutions that make up economic systems such as households, business firms, banks, government agencies, labor unions, and corporations;

e. describe the role of specialization and exchange in the economic process;

f. explain and illustrate how values and beliefs influence different economic decisions;

g. differentiate among various forms of exchange and money;

HIGH SCHOOL

a. explain how the scarcity of productive resources (human, capital, technological, and natural) requires the development of economic systems to make decisions about how goods and services are to be produced and distributed;

b. analyze the role that supply and demand, prices, incentives, and profits play in determining what is produced and distributed in a competitive market system;

c. consider the costs and benefits to society of allocating goods and services through private and public sectors;

d. describe relationships among the various economic institutions that make up economic systems such as households, business firms, banks, government agencies, labor unions, and corporations;

e. analyze the role of specialization and exchange in economic processes;

f. compare how values and beliefs influence economic decisions in different societies;

VII. Production, Distribution, and Consumption (continued)

EARLY GRADES

i. use economic concepts such as supply, demand, and price to help explain events in the community and nation;

j. apply knowledge of economic concepts in developing a response to a current local economic issue, such as how to reduce the flow of trash into a rapidly filling landfill.

MIDDLE GRADES

h. compare basic economic systems according to who determines what is produced, distributed, and consumed;

i. use economic concepts to help explain historical and current developments and issues in local, national, or global contexts;

j. use economic reasoning to compare different proposals for dealing with a contemporary social issue such as unemployment, acid rain, or high quality education.

HIGH SCHOOL

g. compare basic economic systems according to how rules and procedures deal with demand, supply, prices, the role of government, banks, labor and labor unions, savings and investments, and capital;

h. apply economic concepts and reasoning when evaluating historical and contemporary social developments and issues;

i. distinguish between the domestic and global economic systems, and explain how the two interact;

j. apply knowledge of production, distribution, and consumption in the analysis of a public issue such as the allocation of health care or the consumption of energy, and devise an economic plan for accomplishing a socially desirable outcome related to that issue;

k. distinguish between economics as a field of inquiry and the economy.

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VIII. Science, Technology, and Society

Social studies programs should include experiences that provide for the study of relationships among science, technology, and society, so that the learner can:

EARLY GRADES

a. identify and describe examples in which science and technology have changed the lives of people, such as in homemaking, childcare, work, transportation, and communication;

b. identify and describe examples in which science and technology have led to changes in the physical environment, such as the building of dams and levees, offshore oil drilling, medicine from rain forests, and loss of rain forests due to extraction of resources or alternative uses;

c. describe instances in which changes in values, beliefs, and attitudes have resulted from new scientific and technological knowledge, such as conservation of resources and awareness of chemicals harmful to life and the environment;

d. identify examples of laws and policies that govern scientific and technological applications, such as the Endangered Species Act and environmental protection policies;

e. suggest ways to monitor science and technology in order to protect the physical environment, individual rights, and the common good.

MIDDLE GRADES

a. examine and describe the influence of culture on scientific and technological choices and advancement, such as in transportation, medicine, and warfare;

b. show through specific examples how science and technology have changed people's perceptions of the social and natural world, such as in their relationship to the land, animal life, family life, and economic needs, wants, and security;

c. describe examples in which values, beliefs, and attitudes have been influenced by new scientific and technological knowledge, such as the invention of the printing press, conceptions of the universe, applications of atomic energy, and genetic discoveries;

d. explain the need for laws and policies to govern scientific and technological applications, such as in the safety and well-being of workers and consumers and the regulation of utilities, radio, and television;

e. seek reasonable and ethical solutions to problems that arise when scientific advancements and social norms or values come into conflict.

HIGH SCHOOL

a. identify and describe both current and historical examples of the interaction and interdependence of science, technology, and society in a variety of cultural settings;

b. make judgements about how science and technology have transformed the physical world and human society and our understanding of time, space, place, and human-environment interactions;

c. analyze how science and technology influence the core values, beliefs, and attitudes of society, and how core values, beliefs, and attitudes of society shape scientific and technological change;

d. evaluate various policies that have been proposed as ways of dealing with social changes resulting from new technologies, such as genetically engineered plants and animals;

e. recognize and interpret varied perspectives about human societies and the physical world using scientific knowledge, ethical standards, and technologies from diverse world cultures;

f. formulate strategies and develop policies for influencing public discussions associated with technology-society issues, such as the greenhouse effect.

IX. Global Connections

Social studies programs should include experiences that provide for the study of global connections and interdependence, so that the learner can:

EARLY GRADES

a. explore ways that language, art, music, belief systems, and other cultural elements may facilitate global understanding or lead to misunderstanding;

b. give examples of conflict, cooperation, and interdependence among individuals, groups, and nations;

c. examine the effects of changing technologies on the global community;

d. explore causes, consequences, and possible solutions to persistent, contemporary, and emerging global issues, such as pollution and endangered species;

e. examine the relationships and tensions between personal wants and needs and various global concerns, such as use of imported oil, land use, and environmental protection;

f. investigate concerns, issues, standards, and conflicts related to universal human rights, such as the treatment of children, religious groups, and effects of war.

MIDDLE GRADES

a. describe instances in which language, art, music, belief systems, and other cultural elements can facilitate global understanding or cause misunderstanding;

b. analyze examples of conflict, cooperation, and interdependence among groups, societies, and nations;

c. describe and analyze the effects of changing technologies on the global community;

d. explore the causes, consequences, and possible solutions to persistent, contemporary, and emerging global issues, such as health, security, resource allocation, economic development, and environmental quality;

e. describe and explain the relationships and tensions between national sovereignty and global interests, in such matters as territory, natural resources, trade, use of technology, and welfare of people;

f. demonstrate understanding of concerns, standards, issues, and conflicts related to universal human rights;

g. identify and describe the roles of international and multinational organizations.

HIGH SCHOOL

a. explain how language, art, music, belief systems, and other cultural elements can facilitate global understanding or misunderstanding;

b. explain conditions and motivations that contribute to conflict, cooperation, and interdependence among groups, societies, and nations;

c. analyze and evaluate the effects of changing technologies on the global community;

d. analyze the causes, consequences, and possible solutions to persistent, contemporary, and emerging global issues, such as health, security, resource allocation, economic development, and environmental quality;

e. analyze the relationships and tensions between national sovereignty and global interests, in such matters as territory, economic development, nuclear and other weapons, use of natural resources, and human rights concerns;

f. analyze or formulate policy statements demonstrating an understanding of concerns, standards, issues, and conflicts related to universal human rights;

g. describe and evaluate the role of international and multinational organizations in the global arena;

h. illustrate how individual behaviors and decisions connect with global systems.

X. Civic Ideals and Practices

Social studies programs should include experiences that provide for the study of the ideals, principles, and practices of citizenship in a democratic republic, so that the learner can:

EARLY GRADES

a. identify key ideals of the United States' democratic republican form of government, such as individual human dignity, liberty, justice, equality, and the rule of law, and discuss their application in specific situations;

b. identify examples of rights and responsibilities of citizens;

c. locate, access, organize, and apply information about an issue of public concern from multiple points of view;

d. identify and practice selected forms of civic discussion and participation consistent with the ideals of citizens in a democratic republic;

e. explain actions citizens can take to influence public policy decisions;

f. recognize that a variety of formal and informal actors influence and shape public policy;

g. examine the influence of public opinion on personal decision making and government policy on public issues;

h. explain how public policies and citizen behaviors may or may not reflect the stated ideals of a democratic republican form of government;

i. describe how public policies are used to address issues of public concern;

j. recognize and interpret how the "common good" can be strengthened through various forms of citizen action.

MIDDLE GRADES

a. examine the origins and continuing influence of key ideals of the democratic republican form of government, such as individual human dignity, liberty, justice, equality, and the rule of law;

b. identify and interpret sources and examples of the rights and responsibilities of citizens;

c. locate, access, analyze, organize, and apply information about selected public issues—recognizing and explaining multiple points of view;

d. practice forms of civic discussion and participation consistent with the ideals of citizens in a democratic republic;

e. explain and analyze various forms of citizen action that influence public policy decisions;

f. identify and explain the roles of formal and informal political actors in influencing and shaping public policy and decision making;

g. analyze the influence of diverse forms of public opinion on the development of public policy and decision making;

h. analyze the effectiveness of selected public policies and citizen behaviors in realizing the stated ideals of a democratic republican form of government;

i. explain the relationship between policy statements and action plans used to address issues of public concern;

j. examine strategies designed to strengthen the "common good," which consider a range of options for citizen action.

HIGH SCHOOL

a. explain the origins and interpret the continuing influence of key ideals of the democratic republican form of government, such as individual human dignity, liberty, justice, equality, and the rule of law;

b. identify, analyze, interpret, and evaluate sources and examples of citizens' rights and responsibilities;

c. locate, access, analyze, organize, synthesize, evaluate, and apply information about selected public issues—identifying, describing, and evaluating multiple points of view;

d. practice forms of civic discussion and participation consistent with the ideals of citizens in a democratic republic;

e. analyze and evaluate the influence of various forms of citizen action on public policy;

f. analyze a variety of public policies and issues from the perspective of formal and informal political actors;

g. evaluate the effectiveness of public opinion in influencing and shaping public policy development and decision making;

h. evaluate the degree to which public policies and citizen behaviors reflect or foster the stated ideals of a democratic republican form of government;

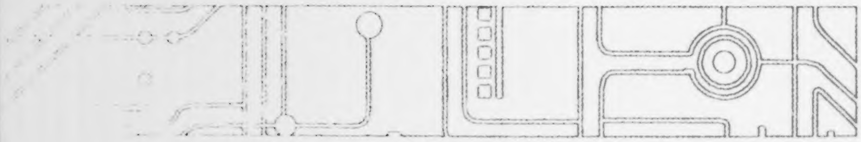
i. construct a policy statement and an action plan to achieve one or more goals related to an issue of public concern;

j. participate in activities to strengthen the "common good," based upon careful evaluation of possible options for citizen action.

Appendix B

NETS Workshop Staging Guide

- Introduction
- Workshop 1: Linking Learning Activities to Content and Technology Standards
- Workshop 2: Multidisciplinary Resource Unit Development
- Workshop 3: Learning Activity Development from Multidisciplinary Resource Units
- Learning Activity Template
- Learning Activity Review Form
- Multidisciplinary Resource Unit Templates (Primary Grades PreK–2, Intermediate Grades 3–5, Middle Grades 6–8, Secondary Grades 9–12)
- Multidisciplinary Resource Unit Review Form



NETS Workshop Staging Guide

Introduction

As staff development specialists or teacher educators plan professional development opportunities for preservice and inservice teachers, materials such as those included in this book may become the basis for modeling sound instructional practice where subject area content is supported by technology resources. These materials may be reconfigured for a variety of purposes:

- Professional development sessions
- Conference workshops
- University course segments
- School board orientations

Included in this appendix is a series of three workshops with sample agendas. Workshop 1 focuses on the development of learning activities found in Section 3 of this book. Workshop 2 focuses on the multidisciplinary resource units found in Section 4 of this book. Workshop 3 focuses on the relationship between the learning activities in Section 3 and the multidisciplinary resource units in Section 4. In each workshop, opportunities are provided to customize the standards references to meet district and/or state needs.

This appendix contains:

- Sample Agendas (Workshop 1, Workshop 2, and Workshop 3)
- Learning Activity Template
- Learning Activity Review Form
- Multidisciplinary Resource Unit Templates
- Multidisciplinary Resource Unit Review Form

In developing a workshop, course session, or extended professional development session, the following sequence of workshops may be used to orient attendees as to how technology can be integrated into the teaching and learning process. The amount of time spent on each step will be based on the total amount of time allocated.

OVERVIEW OF WORKSHOPS

Workshop 1: Linking Learning Activities to Content and Technology Standards
Model a lesson from the content-focused learning activities in Section 3 with participants as the "students." Participants then use the learning activity template to link the learning activity(ies) to local and/or state content standards. Next small groups use the template to develop their own lesson sequence and teach it to another group. A review form is provided for giving feedback to the "teacher."

Workshop 2: Multidisciplinary Resource Unit Development
After completing Workshop 1, participants develop a multidisciplinary resource unit in which the focus is on meeting the NETS for Students. Participants use the multidisciplinary unit template for the appropriate grade level range to address a predetermined theme. A review form is provided for giving feedback on the resource unit.

Workshop 3: Learning Activity Development from Multidisciplinary Resource Units
After completing Workshop 2, participants review a multidisciplinary resource unit to explore thematic activities, tools, and resources. They draw from these activities to develop a sequence of lessons by selecting activities, tools, and resources and placing them in the blank learning activity template. The learning activity is reviewed using the review form and is piloted and refined.

Customizing the Workshop to Meet State and/or District Standards
Use the column entitled "Curriculum Standards" for inserting state and district standards or add to the templates an additional column to the right of the Curriculum Standards column.

Using the Materials
The ideal sequence for these workshops is three half days. However, knowing that time for professional development varies from 20 minutes at a staff meeting to full days, the agendas are structured so that segments can be deleted and compressed, if necessary. The amount of practice time, small group discussion time, and sharing time should be adjusted to fit the audience's needs, expertise, and time constraints.

Note: Please feel free to duplicate the materials as needed for professional development sessions only. Appropriate citations should appear on all materials. See statement on copyright page.

Workshop 1

Linking Learning Activities to Content and Technology Standards

SAMPLE AGENDA

(Approximately 2.5 to 3 hours)

Look at the learning activities in Section 3 of this book. Select one that you believe would be of high interest to the participants. Prepare the necessary materials that would allow you to model this lesson (or a portion thereof) to illustrate the connection between the content area standards and NETS for students. Keep in mind that Section 3 is divided into content areas. You may find that you have teachers from a variety of content areas present at the workshop. Select a content area that is the most appealing to the general audience. (Attempting to do a sample from each curriculum area generally keeps audiences inactive too long.)

OBJECTIVES

The participants will:

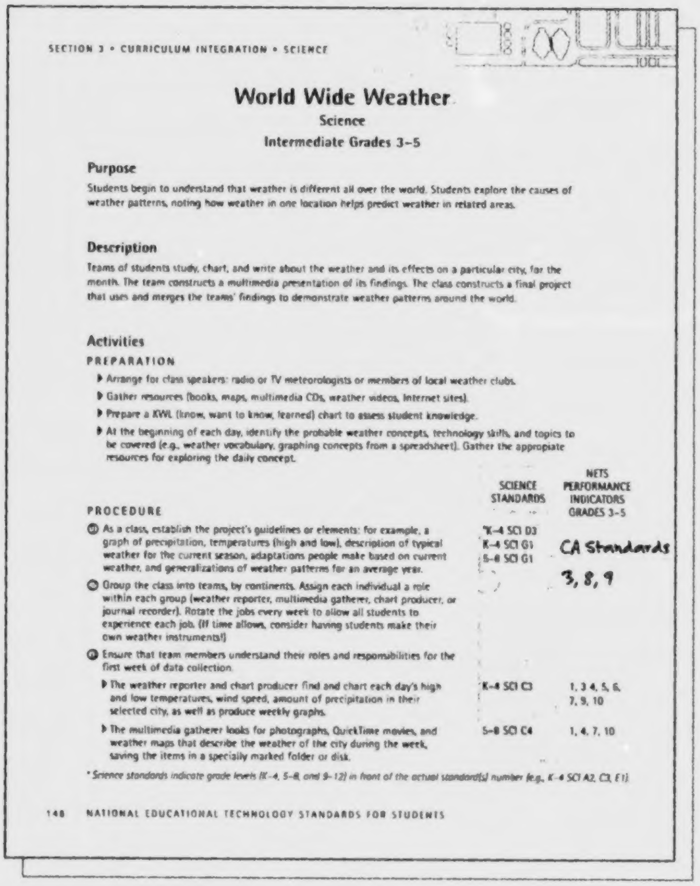
1. Complete the objectives specific to the model learning activity demonstrated by the instructor.
2. Identify the technology and local/state content standards addressed in each component of the model learning activity.

MATERIALS NEEDED:

- Multimedia presentation to introduce standards and learning activities (see www.iste.org/ and click Standards Projects)
- Copies of lesson selected
- Copies of the Learning Activity Template
- Copies of local/state content standards
- Copies of National Educational Technology Standards by grade levels (Section 2)
- Software and resources for the particular lesson

SEQUENCE OF ACTIVITIES:

1. Introduce the model learning activity using the multimedia presentation. *(15 minutes)*
2. Select a lesson from Section 3. Model the lesson with the participants as if they are "students." *(50 minutes)*
3. Discuss how the activities link to the national technology and content standards in Appendix A. *(30 minutes)*
4. Re-examine the activity. In small groups, insert the local/state content standards in the far right margin to the model lesson just completed. *(45 minutes)* See sample Learning Activity Template (later in this appendix).
5. Compare responses of each group and reach consensus on which local/state standards are addressed in the model lesson. *(30 minutes)*



SECTION 3 • CURRICULUM INTEGRATION • SCIENCE

World Wide Weather

Science

Intermediate Grades 3–5

Purpose

Students begin to understand that weather is different all over the world. Students explore the causes of weather patterns, noting how weather in one location helps predict weather in related areas.

Description

Teams of students study, chart, and write about the weather and its effects on a particular city, for the month. The team constructs a multimedia presentation of its findings. The class constructs a final project that uses and merges the teams' findings to demonstrate weather patterns around the world.

Activities

PREPARATION

- Arrange for class speakers: radio or TV meteorologists or members of local weather clubs.
- Gather resources (books, maps, multimedia CDs, weather videos, Internet sites).
- Prepare a KWL (know, want to know, learned) chart to assess student knowledge.
- At the beginning of each day, identify the probable weather concepts, technology skills, and topics to be covered (e.g., weather vocabulary, graphing concepts from a spreadsheet). Gather the appropiate resources for exploring the daily concept.

PROCEDURE	SCIENCE STANDARDS	NETS PERFORMANCE INDICATORS GRADES 3–5
① As a class, establish the project's guidelines or elements: for example, a graph of precipitation, temperatures (high and low), description of typical weather for the current season, adaptations people make based on current weather, and generalizations of weather patterns for an average year.	*K–4 SCI D3 K–4 SCI G1 5–8 SCI G1	CA Standards 3, 8, 9
② Group the class into teams, by continents. Assign each individual a role within each group (weather reporter, multimedia gatherer, chart producer, or journal recorder). Rotate the jobs every week to allow all students to experience each job. (If time allows, consider having students make their own weather instruments!)		
③ Ensure that team members understand their roles and responsibilities for the first week of data collection.		
- The weather reporter and chart producer find and chart each day's high and low temperatures, wind speed, amount of precipitation in their selected city, as well as produce weekly graphs.	K–4 SCI C3	1, 3 4, 5, 6, 7, 9, 10
- The multimedia gatherer looks for photographs, QuickTime movies, and weather maps that describe the weather of the city during the week, saving the items in a specially marked folder or disk.	5–8 SCI C4	1, 4, 7, 10

** Science standards indicate grade levels (K–4, 5–8, and 9–12) in front of the actual standard(s) number (e.g., K–4 SCI A2, C3, F1).*

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Extensions/Follow-Up

- Use the template to have groups develop their own lesson sequence. In the assessment section, participants should make sure that the concluding performance assessment requires both content knowledge and technology skill. Complete the alignment with the content area standards and the NETS for Students. Use the standards appropriate to your purpose. Have small groups share lessons. Sharing locally developed lessons is often the most powerful way to build local expertise. Be prepared to duplicate or post lessons developed. Some may want time to edit or revise prior to submission. *(1 hour or completed independently between workshop sessions)*
- (Optional) If preparing for posting and dissemination, use the activity review form to assess lesson sequences developed.

BEST COPY AVAILABLE

Workshop 2

Multidisciplinary Resource Unit Development

SAMPLE AGENDA

(Approximately 3 hours)

After experiencing a content-based model learning activity, developing a lesson sequence, and teaching that lesson to a group of students, participants will explore the development of multidisciplinary resource units in which the recording of the ideas is based on meeting the NETS for Students.

Select a unit from Section 4 that would most interest the participants. Become familiar with the layout of the unit as it is not in chronological order of presentation to students, but rather is in order of the NETS Performance Indicators for the specific grade-level span.

OBJECTIVE

The participants will develop multidisciplinary resource units.

MATERIALS NEEDED:

- Copies of a multidisciplinary resource unit appropriate to participants
- Copies of the blank Multidisciplinary Resource Unit Template(s) appropriate to grade level of participants
- Copies of local/state content standards
- Copies of National Educational Technology Standards by grade levels (Section 2)

SEQUENCE OF ACTIVITIES:

1. Review the NETS for Students using overhead transparencies or electronic presentation. *(15 minutes)*
2. Introduce the concept of multidisciplinary resource units using an example from Section 4. *(15 minutes)*
3. Develop consensus on a single theme for a multidisciplinary unit the group will develop. *(10 minutes)*
4. Review content and technology standards to determine which of those may be addressed by the thematic unit under development. *(15 minutes)*
5. Break into groups by grade-level span or set groups purposefully mixed with at least one participant from each grade-level span. Individuals or pairs use Internet and other resources to identify and explore ideas and resources for addressing the theme and standards of the unit. *(1 hour)*
6. Small groups share the resources they locate and brainstorm ideas for activities to be included in the unit. Each small group is responsible for completing a template for a grade-level span. *(1 hour)*
7. Small groups report to the larger group on the resources developed for the thematic unit. *(20 minutes)*

Extensions/Follow-Up:

- The activities are piloted in the classroom with students, refinements are made, and the multidisciplinary units are demonstrated with either the same group of teachers or groups of additional teachers.
- Final products are posted on a Web site or duplicated for participants.
- If products are to be posted widely, consider completing an evaluation and revision of the units by others, using the evaluation sheet.

Optional Configuration:

Divide participants by grade-level spans. Have each group work independently on a thematic unit.

Workshop 3

Learning Activity Development from Multidisciplinary Resource Units

SAMPLE AGENDA

(2 hours)

At this point, participants have:

1. Experienced a learning activity as the "student"
2. Linked a prepared lesson with their state/local content standards
3. Reviewed a multidisciplinary resource unit from Section 4, and developed a multidisciplinary resource unit.

The participants take a particular multidisciplinary resource unit, select an activity(ies), develop a lesson plan, and record on the Learning Activity Template provided in Workshop 1. They model the lesson with their peers for feedback and additional implementation ideas.

Before you begin, select a multidisciplinary resource unit to be used for demonstration and as a resource for lesson development. Select a unit that is grade-level appropriate or of particular interest to the participants.

OBJECTIVES

The participants will:

1. Explore multidisciplinary resource units
2. Develop a sequence of learning activities based on one or more of the activities, tools, and resources available from the multidisciplinary resource units

MATERIALS NEEDED:

- Multimedia presentation to introduce standards and learning activities (see www.iste.org/ and click Standards Projects)
- Copies of multidisciplinary resource unit
- Copies of the Learning Activity Template
- Copies of local/state content standards
- Copies of National Educational Technology Standards by grade levels (Section 2)

SEQUENCE OF ACTIVITIES:

1. Review the NETS for Students using the multimedia presentation provided (www.iste.org/ and click Standards Projects). *(15 minutes)*
2. Select one of the multidisciplinary units from Section 4. Introduce the multidisciplinary unit to the participants by identifying the sections of the unit and modeling the procedures for preparing a lesson or lessons from the resources described. Determine what facets of the unit each small group will focus on in developing a learning activity. (This may be done by assigning each Performance Indicator to a group or allowing groups to select activities at random.) *(45 minutes)*

3. Each small group develops a lesson from the activity description and learning resources available. In most cases, the participants will embellish the resources based on what is locally available. *(30 minutes)*
4. Correlate the lesson with the local/state curriculum standards as in Workshop 1. *(15 minutes)*

Follow-Up:

- (Optional) Review each group's lesson using the Learning Activity Review Form.
- Small groups refine the lessons and plan a demonstration of the lesson to be modeled for the whole group.
- The lessons are piloted in the classroom with students, refinements are made, and the model lessons are demonstrated with either the same group of teachers or groups of additional teachers.
- After revisions, the lessons are packaged as a complete set of lessons for a multidisciplinary unit and posted on a Web site for dissemination.

Learning Activity Template

Title: ____________________

Curriculum: ____________________

Grade-Level Span: ____________________

PURPOSE:

DESCRIPTION:

ACTIVITIES	CURRICULUM STANDARDS	NETS PERFORMANCE INDICATORS

TOOLS AND RESOURCES:
(List all Web sites, specific software and hardware, and other needs.)

ASSESSMENT:
(How will you assess the students' learning? If you have a rubric, record it here. Be as specific as possible.)

CREDITS (INCLUDING CONTACT INFORMATION):
(Record the names and e-mail addresses, if possible, of those who contributed to the development of this learning activity.)

COMMENTS:
(Have you taught this learning activity before? What are the great ah ha's/experiences you had?)

Learning Activity Review Form

Activity Name: ______________________________

Curriculum Area: ______________________________

Grade-Level Span: ______________________________

Reviewer(s): ______________________________

____

Please evaluate the activity in the following ways:

0 = Not accurate
1 = Somewhat accurate
2 = Moderately accurate
3 = Highly accurate

1. CONTENT

After reading and discussing this activity with your group, please rate the following statements in terms of how well each applies to this particular activity.

This learning activity is:	0	1	2	3
Appropriate for the grade levels indicated				
A good example of the use of technology in the subject areas				
Sufficiently detailed to generate a full lesson plan				
Contains sufficient technology to assist teachers in understanding how technology can be integrated				
An appropriate representation of the subject area				
Clearly written				
One that I would either implement in my classroom or recommend that a colleague use				
Well documented with the NETS for Students and the curriculum standards in an understandable way				

BEST COPY AVAILABLE

2. STRENGTHS OF THIS LEARNING ACTIVITY

Please list the aspects of this learning activity that you find most valuable or intriguing.

1st ______________________________

2nd ______________________________

3rd ______________________________

Other strengths ______________________________

____

____

3. SUGGESTIONS FOR IMPROVEMENT

Please make constructive suggestions for improving this learning activity.

____

____

____

____

4. OTHER COMMENTS?

Multidisciplinary Resource Unit Template

Primary
Grades
PreK–2

Title: ____________________

Description: ____________________

NETS Performance Indicators *Prior to completion of Grade 2, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Use input devices (e.g., voice activation, mouse, keyboard, and remote control) and output devices (e.g., monitor and printer) to successfully operate computers, VCRs, audiotapes, telephones, and other technologies. (1)			
② Use a variety of media and technology resources for directed and independent learning activities. (1, 3)			
③ Communicate about technology using developmentally appropriate and accurate terminology. (1)			
④ Use developmentally appropriate multimedia resources (e.g., interactive books, educational software, and elementary multimedia encyclopedias) to support learning. (1)			

⑤ Work cooperatively and collaboratively with peers, family members, and others when using technology in the classroom. (2)	
⑥ Demonstrate positive social and ethical behaviors when using technology. (2)	
⑦ Practice responsible use of technology systems and software. (2)	
⑧ Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)	
⑨ Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, and drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)	
⑩ Gather information and communicate with others using telecommunications, with support from teachers, family members, or student partners. (4)	

Multidisciplinary Resource Unit Template

Intermediate Grades 3–5

Title: ____________________

Description: ____________________

NETS Performance Indicators *Prior to completion of Grade 5, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Use keyboards and other common input and output devices (including adaptive devices when necessary) efficiently and effectively. (1)			
② Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide. (1, 2)			
③ Discuss basic issues related to responsible use of technology and information and describe personal consequences of inappropriate use. (2)			
④ Use general-purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)			
⑤ Use technology tools (e.g., multimedia authoring tools, presentation, Web tools, digital cameras, and scanners) for			

individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)	
⑥ Use telecommunications efficiently and effectively to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests. (4)	
⑦ Use telecommunications and online resources (e.g., e-mail, online discussions, and Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)	
⑧ Use technology resources (e.g., calculators, data collection probes, videos, and educational software) for problem-solving, self-directed learning, and extended learning activities. (5, 6)	
⑨ Determine when technology is useful and select the appropriate tool(s) and technology resources for problem-solving, self-directed learning, and extended learning activities. (5, 6)	
⑩ Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information resources. (6)	

Multidisciplinary Resource Unit Template

Middle Grades 6–8

Title: ____________________

Description: ____________________

NETS Performance Indicators *Prior to completion of Grade 8, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)			
② Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)			
③ Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse. (2)			
④ Use content-specific tools, software and simulations (e.g., environmental probes, graphing calculators, exploratory environments, and Web tools) to support learning and research. (3, 5)			
⑤ Apply productivity/multimedia tools and peripherals to support personal			

productivity, group collaboration, and learning throughout the curriculum. (3, 6)
⑥ Design, develop, publish, and present products (e.g., Web pages and videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)
⑦ Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)
⑧ Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
⑨ Demonstrate an understanding of concepts underlying hardware, software, and connectivity, and of practical applications to learning and problem solving. (1, 6)
⑩ Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)

Multidisciplinary Resource Unit Template

Secondary
Grades
9–12

Title: ______________________

Description: ______________________

NETS Performance Indicators *Prior to completion of Grade 12, students will:*	**Activities**	**Curriculum Standards**	**Tools and Resources**
① Identify capabilities and limitations of contemporary and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. (2)			
② Make informed choices among technology systems, resources, and services. (1, 2)			
③ Analyze advantages and disadvantages of widespread use and reliance on technology in the workplace and in society as a whole. (2)			
④ Demonstrate and advocate legal and ethical behaviors among peers, family, and community regarding the use of technology and information. (2)			

⑤ Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, and correspondence). (3, 4)	
⑥ Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)	
⑦ Routinely and efficiently use online information resources to meet needs for collaboration, research, publications, communications, and productivity. (4, 5, 6)	
⑧ Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)	
⑨ Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)	
⑩ Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)	

Multidisciplinary Resource Unit Review Form

Title: ______________________________

Grade-Level Span: ______________________________

Reviewer(s): ______________________________

Please evaluate the unit in the following ways:

1. CONTENT

After reading and discussing this unit with your group, please rate the following statements in terms of how well each applies to this particular unit.

This multidisciplinary resource unit is:

0 = Not accurate
1 = Somewhat accurate
2 = Moderately accurate
3 = Highly accurate

	0	1	2	3
Appropriate for the grade levels indicated				
A good example of the use of technology in the subject areas				
Sufficiently detailed to generate a full lesson plan				
Contains sufficient technology to assist teachers in understanding how technology can be integrated				
An appropriate representation of the subject area				
Clearly written				
One that I would either implement in my classroom or recommend that a colleague use				
Well documented with the NETS for Students and the curriculum standards in an understandable way				

2. STRENGTHS OF THIS MULTIDISCIPLINARY RESOURCE UNIT

Please list the aspects of this unit that you find most valuable or intriguing.

1st ____

2nd ____

3rd ____

Other strengths: ____________________________________

____

____

3. SUGGESTIONS FOR IMPROVEMENT

Please make constructive suggestions for improving this multidisciplinary unit.

____

____

____

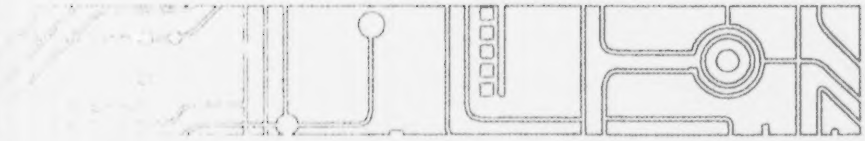
____

4. OTHER COMMENTS?

Appendix C

NETS Project Partnership

- Partner Organization Representatives
- Co-sponsors
- Curriculum Organization Representatives
- Writing Team Participants



Partner Organization Representatives

Joining ISTE as project partners in developing technology standards for PreK–12 education are organizations representing major professional education groups in the United States. Each partner organization provides leadership to a broad spectrum of educators and includes members throughout the nation. Each of the partner organizations brings unique strengths to the project. These partners provide representation from the educational community including: curriculum specialists, leaders in State Departments of Education, school principals, teachers, school board members, librarians, representatives from the business community, and technology experts. The National Educational Technology Standards (NETS) partner organizations include:

Julie Walker (jwalker@ala.org)
American Association of School Librarians (AASL), a division of the American Library Association (ALA)
www.ala.org/aasl/

Ruth Wattenberg (rwattenb@aft.org)
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www.aft.org

Vicki Hancock (vhancock@ascd.org)
Association for Supervision and Curriculum Development (ASCD)
www.ascd.org

Christine Mason (chrism@cec.sped.org)
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Art Sheekey (arthurs@ccsso.org)
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Lynne Schrum (lschrum@coe.uga.edu)
International Society for Technology in Education (ISTE)
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www.nfie.org

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National School Boards Association's (NSBA) ITTE: Education Technology Programs
www.nsba.org/itte/

Sue Kamp (skamp@siia.net)
Software & Information Industry Association (SIIA)
www.siia.net

Co-sponsors

Co-sponsors for the NETS Project provided valuable expertise and contributed significant resources to the development of the technology foundation standards. Current co-sponsors joining ISTE and the NETS Partnership are:

- **Dick Moody** (moody1@apple.com)
  Apple Computer, Inc.
  www.apple.com
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  www.milkenexchange.org
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- **Tiawana Pierce** (tiawana_pierce@ed.gov)
  Program Officer, U.S. Department of Education
  www.ed.gov/technology/

Curriculum Organization Representatives

As the NETS Project unfolds, it is important to note that a significant strength of the project is the participation of representatives from the major curriculum organizations. The curriculum liaisons from each subject area participated in the writing teams responsible for linking the technology standards with the standards from their organization's academic subject area. Curriculum liaisons participated in work sessions designed to identify standards relating specifically to each curriculum area and built interdisciplinary connections among the curricular areas. Curriculum organizations in the NETS Partnership are:

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www.nsta.org

Writing Team Participants

Key to the development of the lesson plans in this book are the Writing Team members. These teachers, technology coordinators, library media specialists, and teacher educators provided and developed lesson plan ideas and identified the technology and curriculum standards achieved with each activity. The Writing Team members are:

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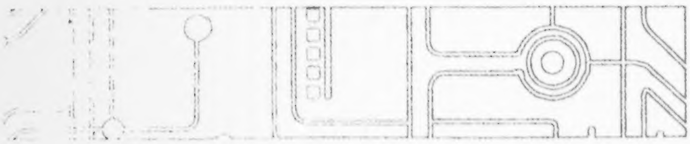
Appendix D

Resources

- Books, Videos, CD-ROMs, and Audiotapes
- Software Listed by Type
- Software Publishers
- National Educational Software Distributors
- Web Sites of Links to Educational Web Sites



Books, Videos, CD-ROMs, and Audiotapes

These resource books, videos, CD-ROMs, and audiotapes from the NETS partners and curriculum organizations are organized by curriculum area, technology or software, and technology implementation (ie., planning, evaluating, funding, etc.).

Curriculum

GENERAL

Association for Supervision and Curriculum Development. (1995). How technology is transforming teaching [Special issue]. *Educational Leadership, 53* (2).

Association for Supervision and Curriculum Development. (1996). *Teaching and learning with technology* [Video and Facilitator's Guide]. Alexandria, VA: Author.

Association for Supervision and Curriculum Development. (1997). Integrating technology into teaching [Special issue]. *Educational Leadership, 55* (3).

Association for Supervision and Curriculum Development. (1998). Integrating technology into the curriculum [Special issue]. *Educational Leadership, 56* (5).

Bernhadt, V. (1998). *Using technology to integrate technology throughout the learning organization* [Audiotape]. Alexandria, VA: Association for Supervision and Curriculum Development.

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ENGLISH LANGUAGE ARTS

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SCIENCE

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SOCIAL STUDIES

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Technology or Software

AppleWorks (formerly ClarisWorks)

Smith, I., & Yoder, S. (1998). *Learning ClarisWorks 5.0 for school, home, and office.* Eugene, OR: International Society for Technology in Education.

EDUCATIONAL SOFTWARE

Association for Supervision and Curriculum Development. (1998). *Only the best 1998–99: The annual guide to the highest-rated software and multimedia.* Alexandria, VA: Author.

Association for Supervision and Curriculum Development. (1998). *Only the best 1990–99: The annual guide to the highest-rated software and multimedia* [CD-ROM]. Alexandria, VA: Author.

Buckleitner, W., Orr, A., & Wolock, E. (1999). *The complete sourcebook on children's software: Vol. 7.* Flemington, NJ: Active Learning Associates, Inc.

California Instructional Technology Clearinghouse. (1998). *Guidelines for the evaluation of instructional technology resources.* Eugene, OR: International Society for Technology in Education.

Educational Software Evaluation Consortium. (2000). *2000 educational software preview guide.* Eugene, OR: International Society for Technology in Education.

Graf, N. (1998). *Using CD-ROM technology with students: The curriculum connection* [Audiotape]. Alexandria, VA: Association for Supervision and Curriculum Development.

HYPERSTUDIO

Muir, M. (1997). *But how do I use HyperStudio with kids? Designing and doing curriculum-based projects.* Eugene, OR: International Society for Technology in Education.

Sharp, V. (1997). *HyperStudio 3.1 in one hour—Macintosh.* Eugene, OR: International Society for Technology in Education.

Sharp, V. (1999). *HyperStudio 3.1/3.0 in one hour—Windows.* Eugene, OR: International Society for Technology in Education.

Smith, I., & Yoder, S. (1998). *Instant success series—Inside HyperStudio: Scripting with HyperLogo.* Eugene, OR: International Society for Technology in Education.

INTERNET/WEB

Association for Supervision and Curriculum Development. (1996). *Teaching and learning with the Internet* [Videos and Facilitator's Guide]. Alexandria, VA: Author.

Harris, J. (1998). *Virtual architecture—Designing and directing curriculum-based telecomputing.* Eugene, OR: International Society for Technology in Education.

Insinnia, E., & Skarecki, E.C. (1998). *Educators take charge—Teaching in the Internet revolution.* Eugene, OR: International Society for Technology in Education.

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Kampman, M. (1998). *Fat crayon multimedia using Kid Pix.* Eugene, OR: International Society for Technology in Education.

MICROSOFT WORKS

Fields, N., Wetzel, K., & Painter, S. (1997). *Microsoft Works 4.0 for the Macintosh—A workbook for educators.* Eugene, OR: International Society for Technology in Education.

Wiebe, J.H., Moreton, J.M., & Slovacek, S.P. (1998). *Works 4.0 for Windows 95 for educators.* Eugene, OR: International Society for Technology in Education.

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Smith, I., & Yoder, S. (1998). *Tearless turtling with MicroWorlds 2.0.* Eugene, OR: International Society for Technology in Education.

Yoder, S., & Moursund, D. (1996). *Introduction to MicroWorlds 2.0—A Logo-based hypermedia environment.* Eugene, OR: International Society for Technology in Education.

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Sharp, V. (1999). *PowerPoint 97 in one hour—Windows version.* Eugene, OR: International Society for Technology in Education.

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Yoder, S., & Smith, I. (1995). *Lookin' good! The elements of document design for beginners.* Eugene, OR: International Society for Technology in Education.

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National School Boards Association. (1997). *Education leadership toolkit: A desktop companion.* Alexandria, VA: Author.

National School Boards Association Council of School Attorneys. (1999). *Legal issues and education technology: A school leader's guide.* Alexandria, VA: National School Boards Association.

National School Boards Association Institute for the Transfer of Technology to Education. (1997). *Technology for students with disabilities: A decision maker's resource guide.* Alexandria, VA: National School Boards Association.

National School Boards Association Technology Leadership Network. (1998). *Technology and school design: Creating spaces for learning.* Alexandria, VA: National School Boards Association.

Software Listed by Type

These software categories or specific titles are listed in the learning activities and multidisciplinary units in Sections 3 and 4. The titles are organized by type of software. The titles under each category do not necessarily represent all the software of that particular type. The category Instructional or Reference Software includes various educational packages that do not fall under the other categories.

Application (Productivity Software, Integrated Packages)
AppleWorks (formerly ClarisWorks) by Apple Computer, Inc.
ClarisWorks for Kids by Apple Computer, Inc.
Kid Works by Knowledge Adventure
Microsoft Office by Microsoft Corporation (This product is a suite of several products rather than an integrated package.)
Microsoft Works by Microsoft Corporation

Big Book (This software prints in poster or big book format.)
Easy Book Deluxe by Sunburst Communications
SuperPrint Deluxe by Scholastic

CAD or Home Design
3D Home Architect Deluxe by Brøderbund
3D Home Design by Brøderbund
AutoCAD LT 98 by Autodesk
Diorama Designer by Tom Snyder Productions
Delta CAD (shareware available at http://dcad.com/)
Home Plan (shareware available at www.homeplansoftware.com/homeplan.htm)

Concept-Mapping or Webbing
Expression by Sunburst Communications
Inspiration® by Inspiration Software

Database
AppleWorks (formerly ClarisWorks) by Apple Computer, Inc.
ClarisWorks for Kids by Apple Computer, Inc.
Filemaker Pro by Filemaker, Inc.
Microsoft Access (part of Microsoft Office) by Microsoft Corporation
Microsoft Works by Microsoft Corporation
Tabletop (includes Tabletop Jr.) by Brøderbund (The Learning Company)

Desktop-Publishing
Adobe PageMaker by Adobe
Easy Book Deluxe by Sunburst Communications
Multimedia Workshop by Knowledge Adventure
Print Shop Deluxe by Brøderbund (The Learning Company)

QuarkXpress by Quark
Student Writing Center by The Learning Company

Digital Art (Graphics, Drawing or Painting, Rendering or Illustration)
Adobe Illustrator by Adobe
Adobe Photoshop by Adobe
Bryce 4 by MetaCreations
Dabbler by Fractal Design
Flying Colors 2 by Magic Mouse Productions
Kai's Power Soap by MetaCreations
Kid Pix Studio Deluxe by Brøderbund (The Learning Company)
Kid Works Deluxe by Knowledge Adventure
Poser 4 by MetaCreations
Raydream by MetaCreations
SuperPrint Deluxe by Scholastic
See Application Software

Drawing or Painting
See Digital Art Software

Electronic-Publishing
See Desktop-Publishing Software, Multimedia-Authoring Software, and Presentation Software

E-mail Programs
Eudora Light 3.1 (Available at http://eudora.qualcomm.com/eudoralight)
Eudora Pro by Qualcomm
Outlook Express by Microsoft Corporation

First Aid Utility
Disinfectant (Available at http://apple.doit.wisc.edu/Apple_Support_Area/Third_Party_Updates)
First Aid 98 & 98 Deluxe by CyberMedia
McAfee 2000 by McAfee.com
Norton Antivirus for Macintosh by Symantec
Norton Utilities by Symantec

FTP
Fetch by Dartmouth College (Available at www.dartmouth.edu/pages/softdev/fetch.htm)
Transmit (formerly Transit) by Panic (Available at www.panic.com/transmit)

Geometry (Geometry Representation)
Cabri Geometry by Texas Instruments
Geometer's Sketchpad by Key Curriculum Press
Shape Up by Sunburst Communications

Graphics
See Digital Arts Software

Graphing
Graph Club by Tom Snyder Productions
GraphPower by Ventura
See Application Software

Image-Manipulating (Photo Manipulation)
Adobe PhotoDeluxe by Adobe
Adobe Photoshop by Adobe
Kai's Power Soap by MetaCreations
Picture It! 99 by Microsoft Corporation

Instructional or Reference
Amazing Animals by DK Multimedia
American Journey: History in Your Hands: The Civil War by Primary Source Media
Astronomy Village: Investigating the Universe Astronomy Village by NASA Classroom of the Future
Bailey's Book House by Edmark
Birds of North America by Thayer Birding Software
Community Construction Kit by Tom Snyder Productions
Decisions, Decisions: Violence in the Media by Tom Snyder Productions
The Factory Deluxe by Sunburst Communications
Jr. Nature Guide series—Birds by Forest Technologies
Just Grandma and Me (Abuelita y Yo) by Brøderbund (The Learning Company)
Let's Pretend series by RMC Interactive
Life Science by Optical Data Corp.
National Inspirer by Tom Snyder Productions
Peterson Multimedia Guides: North American Birds by Houghton Mifflin Interactive
Richard Scarry's Busytown by Simon & Schuster Interactive
Sammy's Science House by Edmark
San Diego Zoo Presents: The Animals! by Mindscape (The Learning Company)
Timeliner by Tom Snyder Productions
Time Traveler by Orange Cherry New Media
Thinkin' Things by Edmark
Weather in Action: Air by AIMS Multimedia
Where in the U.S.A. is Carmen Sandiego? by Brøderbund (The Learning Company)
Zap by Edmark

Interactive Dictionaries
American Heritage Children's Dictionary by Houghton Mifflin Interactive
American Heritage Talking Dictionary by The Learning Company
Merriam-Webster's Collegiate Dictionary by Merriam-Webster, Inc.
My First Incredible, Amazing Words and Pictures by DK Family Learning

Integrated Packages
See Application Software

Internet/Web Browser
Microsoft Internet Explorer by Microsoft Corporation
Netscape Communicator by Netscape Communications

LEGO®
LEGO TC logo (No longer available from LEGO)
ROBOLAB: LEGO Mindstorms Sets for Schools by LEGO Dacta

Logo/Turtle Geometry
Logo Plus by Terrapin Software, Inc.
MicroWorlds by Logo Computer Systems, Inc.
PC Logo by Terrapin Software, Inc.

Mapping
MapMaker Toolkit by Tom Snyder Productions
Neighborhood Map Machine by Tom Snyder Productions
Rand McNally TripMaker Deluxe by Rand McNally New Media

Multimedia-Authoring
Digital Chisel by Pierian Spring Software
HyperCard by Apple Education
HyperStudio by Roger Wagner (Knowledge Adventure)
Macromedia Director Academic by Macromedia
mPower by Mindscape (The Learning Company)
Multimedia Workshop by Knowledge Adventure
Stagecast Creator by Stagecast Software, Inc.

Multimedia Encyclopedias
Compton's Interactive Encyclopedia Deluxe by The Learning Company
Encyclopædia Britannica Multimedia Edition by Encyclopædia Britannica
Grolier Multimedia Encyclopedia by Grolier Interactive
Microsoft Encarta Encyclopedia Deluxe by Microsoft Corporation
World Book Deluxe Edition by World Book

Photo Manipulation
See Image-Manipulating Software

Presentation
AppleWorks (formerly ClarisWorks) by Apple Computer, Inc.
ClarisWorks for Kids by Apple Computer, Inc.
Kid Pix Studio Deluxe by Brøderbund (The Learning Company)
PowerPoint by Microsoft Corporation (also part of Microsoft Office)
See Multimedia-Authoring Software

Productivity
See Application Software

Rendering or Illustration
See Digital Art Software

Sound Recording
Pure Voice by Qualcomm

Spreadsheet
AppleWorks (formerly ClarisWorks) by Apple Computer, Inc.
ClarisWorks for Kids by Apple Computer, Inc.
Cruncher by Knowledge Adventure
Microsoft Excel by Microsoft Corporation (also part of Microsoft Office)
Microsoft Works by Microsoft Corporation

Videoconferencing
CU-SeeMe by White Pine Software

Video-Production/Editing
Adobe Premiere by Adobe
Avid Videoshop by Strata
Multimedia Workshop by Knowledge Adventure
QuickTime by Apple Computer, Inc. (available at www.apple.com/quicktime)
QuickTime Virtual Reality (QTVR) by Apple Computer, Inc. (available at www.apple.com)

Web-Capturing
WebWhacker by Forefront Group *(see Forest Technologies)*
Web Buddy by DataViz

Web Page Creation
FrontPage by Microsoft Corporation
Home Page (formerly Claris Home Page) by Filemaker, Inc.
Netscape Composer by Netscape Communications (part of Netscape Communicator)
The Print Shop Web Site Designer by Brøderbund (The Learning Company)
Web Workshop by Sunburst Communications

Word-Processing/Writing
AppleWorks (formerly ClarisWorks) by Apple Computer, Inc.
ClarisWorks for Kids by Apple Computer, Inc.
Aspects (collaborative electronic writing program) by Group Logic
Kid Works Deluxe by Knowledge Adventure
Microsoft Word by Microsoft Corporation (also part of Microsoft Office)
Microsoft Works by Microsoft Corporation

Software Publishers

Many software companies have been purchased by other companies. Another company name in parentheses after the company name indicates the purchasing company.

Many software distributors offer educational discounts. A separate listing of educational software distributors follows this list.

Adobe Systems, Inc.
Contact Douglas Stewart for reseller referrals
800.279.2795
Fax: 608.221.5217
www.adobe.com

AIMS Multimedia
9710 DeSoto Ave.
Chatworth, CA 91311
818.773.4300
800.367.2467
Fax: 818.341.6700
www.aims-multimedia.com

Apple Computer, Inc.
1 Infinite Loop
Cupertino, CA 95014
408.996.1010
800.795.1000
www.apple.com

Apple Education
408.987.3022
800.747.7483
Fax: 408.987.7105
www.apple.com/education

Autodesk, Inc.
Order from an authorized distributor
www.autodesk.com

Brøderbund Software (see The Learning Company, a division of Mattel)

CyberMedia
3000 Ocean Park Blvd., Suite 2001
Santa Monica, CA 90405
310.581.4700
800.721.7824
Fax: 310.581.4720
www.cybermedia.com

DK Family Learning
7800 Southland Blvd., Suite 200
Orlando, FL 32809
407.857.5463
800.352.6651
Fax: 407.888.1879
http://DKFamily.com

DK Multimedia
95 Madison Ave.
New York, NY 10016
212.213.4800
888.342.5357
Fax: 212.213.5240
www.dk.com

DataViz, Inc.
55 Corporate Dr.
Trumbull, CT 06611
203.268.0030
800.733.0030
Fax: 203.268.4345
www.dataviz.com

Edmark (IBM Corp.)
PO Box 97021
Redmond, WA 98073-9721
425.556.8400
800.362.2890
Fax: 425.556.8430
www.edmark.com

Encyclopædia Britannica
310 S. Michigan Ave.
Chicago, IL 60604
312.347.7309
800.747.8503
www.eb.com

FileMaker, Inc.
5201 Patrick Henry Dr.
Santa Clara, CA 95054
408.987.7000
800.725.2747
Fax: 408.987.7563
www.filemaker.com

Forest Technologies
765 Industrial Dr.
Cary, IL 60013
800.544.3356
Fax: 847.516.8210
www.ForestTech.com

Grolier Interactive
90 Sherman Turnpike
Danbury, CT 06816
203.797.3530
800.217.1495
Fax: 203.797.3835
www.gi.grolier.com

Group Logic
1408 North Fillmore St., Suite 10
Arlington, VA 22201
703.528.1555
800.476.8781
Fax: 703.528.3296

Houghton Mifflin Interactive
120 Beacon St.
Somerville, MA 02143
617.503.4800
800.829.7962
Fax: 800.634.7568
www.hminet.com

Inspiration Software, Inc.
7412 SW Beaverton Hillsdale Hwy., Suite 102
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503.297.3004
800.877.4292
Fax: 503.297.4676
www.inspiration.com

Key Curriculum Press, Inc.
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Emeryville, CA 94608
510.548.2304
800.995.6284
Fax: 510.548.0755 or 800.541.2446
www.keypress.com

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4100 West 190th St.
Torrance, CA 90504
310.793.0600
800.545.7677
Fax: 310.793.0601
www.KnowledgeAdventure.com

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Novato, CA 94947
415.382.4400
800.825.4420
Fax: 415.382.4419
www.broder.com

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PO Box 1707
Pittsburg, KS 66762
800.362.4308
Fax: 888.534.6784
www.lego.com/dacta/

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PO Box 162
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514.331.7090
800.321.5646
Fax: 514.331.1380
www.lcsi.ca

Macromedia
Order from a national educational software distributor
www.macromedia.com

Magic Mouse Productions
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Fax: 415.669.7009
www.magicmouse.com

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Santa Clara, CA 95054
408.346.3660
www.mcafee.com

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Springfield, MA 01102
413.734.3134
800.828.1880
Fax: 413.731.5979
www.m-w.com

MetaCreations
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Carpinteria, CA 93013
805.566.6200
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www.metacreations.com

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Mindscape (see The Learning Company)

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Wheeling, WV 26003
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Fax: 304.243.2497
www.cotf.edu

National Geographic Interactive
1145 17th NW
Washington, DC 20036
202.828.5664
800.368.2728
Fax: 202.828.6679
www.nationalgeographic.com

Netscape Communications
Download from Web site
www.netscape.com

Optical Data Corp.
512 Means St. NW, Suite 100
Atlanta, GA 30318
404.221.4500
800.887.0022
Fax: 404.221.4520
www.opticaldata.com

Orange Cherry New Media
PO Box 390
Pound Ridge, NY 10576
800.672.6002
Fax: 914.764.0104
www.byronpreiss.com/orange/aboutocnm.htm

Pierian Spring Software
5200 SW Macadam Ave., Suite 570
Portland, OR 97201
503.222.2044
800.472.8578
Fax: 503.222.3235
www.pierian.com

Primary Source Media
An Imprint of the Gale Group
12 Lunar Drive
Woodbridge, CT 06525
203.397.2600
800.444.0799
Fax: 203.397.3893
www.psmedia.com

Qualcomm, Inc.
510.490.4750
800.238.3672
http://store.qualcomm.com

Quark, Inc.
1800 Grant St.
Denver, CO 80203
307.772.7100
800.676.4575
Fax: 307.772.7123
www.quark.com

Rand McNally New Media
8255 North Central Park Ave.
Skokie, IL 60076
847.329.6576
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Fax: 847.674.4496
www.randmcnally.com

RMC Interactive
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941.355.2201
800.762.6443
Fax: 941.358.8802
www.mindmagic.com

Roger Wagner Publishing (Knowledge Adventure)
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www.scholastic.com

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Fax: 212.698.7555
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www.stagecast.com

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800.336.1022
Fax: 805.473.7382
www.venturaES.com

White Pine Software, Inc.
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Nashua, NH 03063
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Fax: 603.886.9051
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Web Sites of Links to Educational Web Sites

Many Web sites were given as resources in the lessons in Sections 3 and 4. Here are additional Web sites that link to valuable educational Web sites or offer lessons and projects that make use of technology.

These sites evaluate educational Web sites, organize them by subject area, and provide information and links to the positively evaluated sites.

BLUE WEB'N
www.kn.pacbell.com/wired/bluewebn/

Busy Teacher's Web Site
www.ceismc.gatech.edu/BusyT/TOC.html

Ed's & Edie's Oasis
www.edsoasis.org/

Education World—Where Educators Go To Learn
www.education-world.com/

Kathy Schrock's Guide for Educators
http://discoveryschool.com/schrockguide/

Ron MacKinnon's Educational Bookmarks
http://juliet.stfx.ca/people/stu/x94emj/bookmark.html

Scholastic Network
www.scholasticnetwork.com/

Teacher/Pathfinder
http://teacherpathfinder.org/

The Educator's Toolkit
www.eagle.ca/~matink/

The Learning Space
By Ann McGlone
www.learningspace.org

The Teacher Resource Page
www.atlantic.net/~klesyk/

Web Sites and Resources for Teachers
By Vicki Sharp and Richard Sharp
www.csun.edu/~vceed009/

Glossary

3-D ANIMATION SOFTWARE

Software that displays on a computer screen representations of three-dimensional objects in motion.

3-DIMENSIONAL MODEL (3-D MODEL)

A model that represents a three-dimensional object.

ADAPTIVE/ASSISTIVE HARDWARE

Hardware (external and internal devices) to adapt the computer's capability for input, processing, and output for students of different needs (e.g., touch screen, voice-recognition devices).

ASSESSMENT RUBRIC

An established set of rules that define the quality of a performance or product.

AUTHENTIC DATA

Data arising from real-world situations as opposed to contrived situations or simulations.

AUTHORING TOOL

Software that allows an individual to develop or program an application to meet specific objectives (e.g., HyperCard, PILOT).

BROADCAST RESOURCES

Electronic resources distributed from one origination point and received at more than one point distant from the origin (e.g., CNN Newsroom, Channel One, Discovery Channel).

BROWSER

Tool used to access and manipulate information on the Web (e.g., Netscape Navigator, Internet Explorer).

CLASSROOM CLUSTER

Small groups of workstations or learners in a classroom setting.

CLIP ART

Pictures provided to be copied and integrated within larger works.

COLLABORATIVE LEARNING

Group learning strategies in which members of the group of learners are responsible for providing the content and learning experiences—members teach each other.

COMPUTER-ASSISTED DRAFTING (CAD) SOFTWARE

Software designed to facilitate computer-generated drawings or schematics.

COMPUTING ENVIRONMENTS

Particular combinations of hardware and software that determine how a user works with a computer system. Single-user and networked computers are examples of computing environments, as are Windows and Macintosh operating systems and the machines they run on.

CONCEPT-MAPPING SOFTWARE

Software that can graphically represent the relationships among ideas (e.g., Inspiration®).

CONSTRUCTIVISM

A theory and teaching strategy holding that learners actively acquire or "construct" new knowledge by relating new information to prior experience. It contrasts with strategies that rely primarily on passive reception of teacher-presented information.

CURRICULUM AREA STANDARDS

Guidelines specifying what should be learned, taught, or acquired in the study of a particular discipline (e.g., NCTM Standards for Mathematics Education).

CURRICULUM INTEGRATION

Use of technology to support and enhance learning and teaching in the daily course of studying academic content.

DEVELOPMENTALLY APPROPRIATE

Materials, activities, or expectations that align with the social, intellectual, and physical maturity of the intended audience or treatment group.

DIGITAL ARCHIVE

Information stored in digital format.

DIGITAL ART

Artwork stored in digital format.

DIGITAL CAMERA

A still or video camera that captures and stores images in digital format.

DIGITAL IMAGE

Visual image stored in digital format.

DIGITAL STORAGE SYSTEM

Information management system that holds information in digital format.

DISTANCE LEARNING

An educational practice involving communication between two or more remote sites.

DISTORTION FILTERS

Add-ons to high-end graphics programs (e.g., Adobe Photoshop) that modify or distort images in a predictable or controllable way. A distortion filter might, for example, cause a picture to appear as if it had been drawn in charcoal.

DOWNLOAD

Receipt of a file stored away from the workstation involved in the retrieval.

DRAWING SOFTWARE

A computer program that allows the user to simulate drawing. Image elements created with a draw program are stored as mathematical formulas, and each element can be changed or moved independently (e.g., Adobe Illustrator, Macromedia FreeHand).

DYNAMIC GEOMETRIC SOFTWARE

Computer software that enables learners to manipulate geometric parameters and images to illustrate mathematical concepts (e.g., Geometric Supposer).

DYNAMIC INFORMATION SHARING

Technology- and telecommunications-enabled exchange or distribution of information among a dispersed group of learners (e.g., Kids Network, student-maintained electronic conferencing, electronic mail).

E-COMMERCE (ELECTRONIC COMMERCE)

Commerce conducted through electronic transactions. May refer to online transactions between humans or accounting systems.

EDUCATIONAL COMPUTING AND TECHNOLOGY

Educational computing and technology encompasses knowledge about and use of computers and related technologies in (1) delivery, development, prescription, and assessment of instruction; (2) effective uses of computers as an aid to problem solving; (3) school and classroom administration; (4) educational research; (5) electronic information access and exchange; (6) personal and professional productivity; and (7) computer science education.

EDUCATIONAL COMPUTING AND TECHNOLOGY LITERACY

This area includes (1) issues of technology use in society; (2) fundamental vocabulary and operations of computer/technology-based systems; (3) use of tool applications for personal, academic, and instructional productivity; and (4) use of the computer as a tool for problem solving.

ELECTRONIC JOURNAL

Journal created electronically, as with word-processing software, and stored in digital format.

ELECTRONIC MEETING

Meeting conducted across a network. May include voice, video, or online text and image exchange (e.g., NetMeeting session, two-way compressed videoconference).

ELECTRONIC PRESENTATION

Presentation of material through or with substantial support of electronic media (e.g., PowerPoint slideshow).

ELECTRONIC-PUBLISHING SOFTWARE

Computer software that enables the user to publish in any one or more of many types of media (e.g., HyperStudio, Kid Pix, Home Page).

ELECTRONIC (REFERENCE) RESOURCES

Collections of reference materials in electronic format (e.g., Encarta, ERIC—Educational Resources Information Centers).

E-MAIL (ELECTRONIC MAIL)

Correspondence across a network by way of an online message-handling computer program.

ENRICHMENT ACTIVITIES

Learning activities designed to extend, enhance, and connect core learning activities (e.g., computing career guidance, preparation for college, motivational excursions, and extracurricular activities such as computer clubs and organized competitions).

ENVIRONMENTAL PROBE

Computer peripheral that senses environmental data and communicates readings directly into the computer for recording and storage (e.g., pH sensor, humidity sensor).

EQUITY ISSUES

Issues of equal distribution and use of computers and related technologies and resources across subpopulations of students and educators.

ETHICAL ISSUES

Those issues that deal with the ethical use of software and computers and related technologies by students and educators (e.g., privacy, piracy, integrity of information, responsibility for content, and use of recreational applications).

FAIR USE

A legal principle that allows portions of a copyrighted work to be used for educational purposes without permission from the copyright holder (e.g., use of portions of a copyrighted work with students by educators to illustrate a concept).

FAQ (FREQUENTLY ASKED QUESTIONS)

A technique for disseminating information through publication of a group of commonly asked questions and answers about a particular subject.

GRAPHICS PROGRAM (GRAPHICS SOFTWARE, GRAPHICS UTILITIES)

One of a number of types of computer software that enable the user to create or manipulate illustrations, graphs, drafting products, and a variety of other images.

GRAPHING CALCULATORS

A hand-held calculator that, in addition to performing calculations and functional operations, can graph functions and relations.

HUMAN ISSUES

Those issues that deal with societal and humanistic impact of information, computer, and related technologies.

HYPERMEDIA

Hypermedia refers to interactive, nonlinear presentation of information in which more than one medium may be used (e.g., print, video, and computer), and in which users select their own paths through the material.

HYPERMEDIA STACK

A collection of linked hypermedia objects (pages) stored as a single file.

HYPERMEDIA TOOL

A computer-software program that supports development and modification of hypermedia stacks such as presentations, adaptive online exams, and Web sites (e.g., HyperStudio, FrontPage).

IMAGE-MANIPULATING SOFTWARE

A graphics program that enables the user to make changes in orientation, shape, size, shading, or color of images (e.g., Photoshop).

INFORMATION ACCESS AND DELIVERY TOOLS

Hardware and software used to access electronically archived information and computer- or satellite-based telecommunications networks (e.g., FTP, search engines, satellite downlink and receivers, Web browsers).

INQUIRY-BASED LEARNING

Learning strategies in which learners discover concepts, skills, or knowledge through active investigation.

INTEGRATED SOFTWARE PACKAGE

A program that combines several software applications with a common interface and data sharing among the tools in the collection. Typically, packages include word processing, database management, telecommunications, spreadsheet, and business graphics (e.g., AppleWorks).

INTERNET

The Internet is the system of thousands of interconnected commercial, academic, and government networks around the world all using common protocols to share information.

ITV (INTERACTIVE TV) PROGRAMS

Broadcast programs that allow two-way communications between the television viewer and the service provider.

JAVA

A Sun Microsystems programming language for intranet and Internet (World Wide Web) applications. Java is designed to occupy small amounts of memory to run, and it does its own memory management. Java may be run stand-alone or launched from within HTML pages. Modern Web browsers support Java.

JAVA APPLET

A small program in the Java language that is embedded in an HTML Web page.

KNOWLEDGE NAVIGATOR

An intelligent search agent that identifies and retrieves "best" information for the user based on parameters specified for each search.

LEGAL ISSUES

Those issues that deal with the legal use of information, software, and technology by students and educators.

LESSON SEQUENCE

A description of a learning activity that includes the content to be covered and the order in which the material will be presented or encountered by the student.

LOGO

A programming language especially good for students because of its ease of use and graphics capability.

MANIPULATIVE MATERIALS

Materials that support tactile learning and reinforcement of concepts (e.g., blocks, rods).

MEDIA LITERACY

The ability to assess the purpose, legitimacy, and appropriateness of information received, particularly mass media messages.

MICROWORLDS

Computing environments (see definition) that allow users to interact with or construct objects that respond according to set or user-defined rules. Microworlds can be created with tools such as virtual reality software, Logo, and Stagecast Creator.

MINILESSON

A brief demonstration of a learning or teaching strategy, technique, or approach within an authentic learning environment for the purpose of staff development.

MULTIDISCIPLINARY

Involving content typically associated with more than one academic discipline.

MULTIMEDIA

A combination of media used to disseminate information (e.g., audio, video, still image, and print) under computer control.

MULTIMEDIA-AUTHORING SOFTWARE

Computer software used to prepare a multimedia presentation or interactive session or products (e.g., HyperStudio, Macromedia Director).

MULTIMEDIA COMPUTER

A personal computer workstation capable of supporting multimedia, including high-quality audio, video, still images, and text. Usually indicates having a CD-ROM drive.

MULTIMEDIA-PRESENTATION SOFTWARE

Computer software designed to support presentations involving multimedia (e.g., PowerPoint).

MULTIMEDIA PROGRAM

Computer-software program that supports and makes use of multimedia in carrying out its function (e.g., Living Books, LightSpan).

MULTIPATH PROGRESSION

Strategies that allow the navigator to exercise options of sequence in traversing a multistep process.

MULTISENSORY STIMULATION

Sensory input that involves more than one of the senses.

NONTRADITIONAL TRAINING SITUATIONS

Training arrangements in which the trainer and trainee are neither person-to-person, face-to-face, nor in a mentoring situation (e.g., multimedia applications used to train individuals, satellite-delivered staff development).

ONLINE CONFERENCE

Meeting conducted across a network.

ONLINE SERVICES

Computer-based telecommunications networks that allow users to access, retrieve, and communicate information; broadcast messages; send electronic mail; and participate in user forums (e.g., America Online).

PAINTING SOFTWARE

A graphics program that enables the user to simulate painting and to manipulate image colors. Paint images are stored as patterns of dots called bitmaps. Individual image elements cannot be moved independently (e.g., Photoshop, PhotoDeluxe). (See drawing software.)

PARALLEL STORIES

Stories with the same plot, different characters, different setting, and so forth.

PERFORMANCE INDICATORS

Descriptions of behaviors that demonstrate acquisition of desired knowledge, attitudes, or skills.

PHOTO-RETOUCHING SOFTWARE

Computer software used to import and modify digitized photographs (e.g., Photoshop).

PRINT/GRAPHIC UTILITIES

Tools that can be used to make picture-related documents such as banners, signs, certificates, and cards (e.g., PrintShop, SuperPrint).

PRODUCTIVITY TOOLS

Productivity tools refer to any type of software associated with computers and related technologies that can be used as tools for personal, professional, or classroom productivity (e.g., Microsoft Office, AppleWorks).

PROFILE

A collection of performance indicators that, when taken together, define expected characteristics or behaviors.

PROGRAMMING ENVIRONMENT

Software development tools that support the design, implementation, verification, and application of new programs using some type of programming or authoring language (e.g., Pascal, Logo, BASIC, HyperTalk, HyperLogo).

PROJECT-BASED

Undertaken in the context of progress toward completion of a project.

PYTHAGOREAN TRIPLES

Three numbers that can represent the lengths of the sides of a right triangle. The square of the largest of the set of numbers must equal the sum of the squares of the other two numbers in the triple (e.g., 6, 8, 10).

REAL-TIME VIDEOCONFERENCING

An online conference using video in which all sites participate simultaneously.

RELATED TECHNOLOGIES

Digital technologies such as computers, videodisc players, CD-ROM players, imaging devices, interfaced musical equipment, robots, and so forth.

REMOTE INFORMATION ACCESS AND RETRIEVAL

Use of telecommunications networks to obtain information from a remote site (e.g., use of Dialog Information Network to research a given topic such as the ERIC database or stock market prices).

RESOURCE UNIT

A term used in this book to denote a set of activities organized around a powerful theme. Each unit provides tools and resources and addresses the theme with a variety of activities covering both subject area and technology standards.

RUBRIC

An established set of rules or guidelines.

SCIENTIFIC PROBES

Computer peripherals that measure and report data directly to a computer program where it is stored. Used in scientific experimentation. See environmental probe (e.g., temperature probe, distance sensor).

SEARCH ENGINES

Software that allows retrieval of information from electronic databases (library catalogs, CD-ROMs, the Web) by locating user-defined characteristics of data such as word patterns, dates, or file formats.

SIMULATION PROGRAM

A computer program that simulates an authentic system (city, pond, company, organism) and responds to choices made by program users (e.g., Oregon Trail II, SimCity).

SSR (SILENT SUSTAINED READING)

Specific time allocated in the day or week during which everyone in a school or class stops what they are doing and reads silently.

STUDENT-CENTERED/DIRECTED INSTRUCTION

A constructivist (see definition) approach to teaching in which teachers try to take advantage of students' prior knowledge and interests to encourage active engagement in intellectual exploration, problem solving, and synthesis of new knowledge.

SUPPORT PERSONNEL

Persons charged with facilitating the education activities of professionals in a school setting.

TEACHER UTILITIES

Software tools that can be used by the teacher to provide instructional or personal/professional enhancements to existing applications (e.g., grade book program, curriculum manager, test generator, class roster manager).

TECHNOLOGY-BASED INSTRUCTION

Instructional applications that involve some aspect of computers or related technologies (e.g., use of a teacher-constructed database in a social studies unit; using a graphing utility to teach relationships between two measures in economics, science, or mathematics).

TECHNOLOGY RESOURCE PERSON

A person designated to provide knowledge, information, and support for hardware, software, networks, and staff development within an educational institution (e.g., School District Technology Coordinator).

TELECOMMUNICATIONS

Telecommunications includes all types of electronic communication services, including satellite, fiber-optic, computer-based transmission, telephone, and radio.

THEMATIC UNIT

A unit of instruction related to a particular theme (e.g., money, time, change, oceans) to which all unit activities connect.

TIMELINE SOFTWARE

Software containing a framework for establishing a timeline and populating that timeline with multimedia resource material (letters, awards, voice recordings, video, photographs) to depict conditions and events at each particular point along the time continuum addressed (e.g., Tom Snyder's TimeLiner).

URL

The Uniform Resource Locator is the address on the World Wide Web used to access a particular Web server, site, or page (e.g., www.iste.org).

VIDEOCONFERENCING

Video and audio transmitted live via telecommunications that allow people at remote locations to see and hear each other. Examples of videoconferencing systems used in education include VTEL and CU-SeeMe.

VIRTUAL REALITY (VR) SOFTWARE

Computer software that allows the creation of realistic depictions of physical space. Users appear to move through and manipulate objects in this artificial environment (e.g., QuickTime Virtual Reality).

VIRTUAL TOOL

Development software that creates programs for several computer environments.

VIRTUAL WORLDS

See virtual reality software.

WEB

See World Wide Web.

WEB PAGE

Site on the Web representing an individual's, organization's, or institution's Web presence.

WEB-PAGE CREATION SOFTWARE

Editing tools that generate and display files in hypertext markup language (World Wide Web) format (e.g., PageMill, Home Page, FrontPage).

WEB SEARCH

Invoking one of the many search engines available for locating information on the Web related to specific key words.

WEB SITE

See Web page.

WEBBING

Graphically representing dependence of each concept, skill, or ability on all its prerequisites. See concept-mapping software.

WEBMASTER

An individual with responsibility for maintaining a Web site.

WEBQUEST

A learning activity that involves searching for specified information on the Web. Developed by Bernie Dodge and Tom March at San Diego State University.

WORLD WIDE WEB (WEB)

(1) The worldwide array of hypertext transfer protocol (http) servers allowing access to text, graphics, sound files, and more to be mixed together and accessed through the Internet. (2) Used loosely to refer to the whole universe of resources available using Gopher, FTP, http, Telnet, USENET, WAIS, and some other tools.

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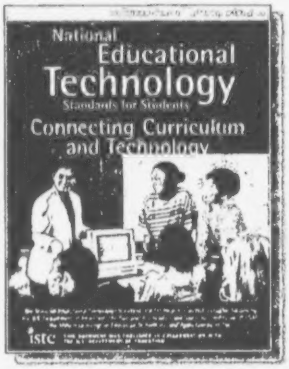

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The NETS Project was initiated by the International Society for Technology in Education's Accreditation and Professional Standards Committee. ISTE has emerged as a recognized leader among professional organizations for educators involved with technology. ISTE's mission is to promote appropriate uses of technology to support and improve learning, teaching, and administration. Its members are teachers, technology coordinators, education administrators, and teacher educators. ISTE supports all subject area disciplines by providing publications, conferences, online information, and services that help educators combine the knowledge and skills of their teaching fields with the application of technologies for improvement of learning and teaching.

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